

# A revision of *Physotarsus* Townes (Hymenoptera: Ichneumonidae: Ctenopelmatinae), with description of 18 new species

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## Abstract

The species of *Physotarsus* Townes are revised. *Physotarsus* is expanded to include 18 new species: *P. albus* Zhaurova, **n. sp.** (Brazil), *P. claviger* Zhaurova, **n. sp.** (Argentina), *P. concavus* Zhaurova, **n. sp.** (USA & Mexico), *P. cordatus* Zhaurova, **n. sp.** (USA), *P. emarginatus* Zhaurova, **n. sp.** (USA), *P. flavipennis* Zhaurova, **n. sp.** (USA), *P. foveatus* Zhaurova, **n. sp.** (USA & Mexico), *P. gineus* Zhaurova, **n. sp.** (USA), *P. glabellus* Zhaurova, **n. sp.** (Brazil), *P. jamesi* Zhaurova, **n. sp.** (Dominica), *P. leucohypopygus* Zhaurova, **n. sp.** (Brazil), *P. luteus* Zhaurova, **n. sp.** (Mexico), *P. melipennis* Zhaurova, **n. sp.** (USA), *P. melotarsus* Zhaurova, **n. sp.** (USA), *P. niveus* Zhaurova, **n. sp.** (Brazil), *P. oculatus* Zhaurova, **n. sp.** (Brazil), *P. tonicus* Zhaurova, **n. sp.** (USA), and *P. truncatus* Zhaurova, **n. sp.** (USA). *Physotarsus davidi* Gauld, 1997 is treated as a junior subjective synonym of *P. varicornis* (Cameron, 1886) and a lectotype is designated for the latter. *Physotarsus fabioi* Gauld, 1997 is removed from the Scolobatini and left incertae sedis in the Ctenopelmatinae. A key to all known species of *Physotarsus*, and redescrptions of all previously described species are also provided. With 25 valid species, *Physotarsus* is now the largest genus in the Scolobatini.

**Key words:** Scolobatini, Argidae, parasitoid

## Introduction

The family Ichneumonidae (Hymenoptera: Ichneumonoidea) contains over 21,805 valid species (Yu & Horstmann 1997), arranged in approximately 40 subfamilies. The number of recognized subfamilies has increased steadily since the work of Townes (1969, 1970 a, b, 1971), who revised the ichneumonid genera and established current concepts for most of the major groupings within the family. Some disagreements remain regarding subfamily limits and the placement of several genera (Gauld 2002; Gauld & Wahl 2002; Quicke *et al.* 2005, 2009), but these are relatively minor. The subfamily Ctenopelmatinae (=Scolobatinae *sensu* Townes & Townes 1951) is a morphologically diverse subfamily of koinobiont endoparasitoids with over 100 currently valid genera and over 1100 described species listed by Yu & Horstmann (1997) with several more recent additions of species (e.g. Kasparyan 2000, 2003, 2004, 2006). Quicke *et al.* (2009) provide evidence that the subfamily is paraphyletic, echoing sentiments expressed by Gauld & Wahl (2006). The ctenopelmatine tribe Scolobatini is widespread in distribution, with four genera recorded from the New World, three of these endemic. The most detailed and recent works on Scolobatini are those of Ian Gauld (1984, 1997) and Zhaurova & Wharton (2009). Zhaurova & Wharton (2009) recently suggested separating Westwoodiini from Scolobatini based on their phylogenetic analysis of morphological data.

New World scolobatines range in body length from 3–10mm, and vary quite widely in color. Hosts are sawflies in the family Argidae, but very few host records are available overall (Yu & Horstmann 1997; Zhaurova 2006). The only known host record for *Physotarsus* Townes is that of *Physotarsus adriani* Gauld, 1997 parasitising the sawfly *Trochophora lobata* (Erichson) (Gauld 1997; Janzen 2006). Townes (1970b) suggested that argids were likely to be the hosts for the entire tribe Scolobatini s. s. (excluding the Australian westwoodiines).

*Physotarsus* is known primarily from the Neotropics. Six of the nine previously described species are known only from Costa Rica (Gauld 1997), two others only from Mexico (Townes & Townes 1966) and the ninth only from Guatemala (Townes & Townes 1966). Estimates as to the relative size of this genus have varied from “moderate” (Gauld 1997) to “rather large” (Townes 1970b), and Townes (1970b) gives the distribution as extending from southern United States to Argentina based largely on undescribed material. In order to provide a better understanding of morphological variation within the genus as well as baseline data for assessment of relationships among the Scolobatini, we describe several new species below. At the end of the descriptive section, we also provide comments on the placement of *Physotarsus fabioi* Gauld, 1997.

## Materials and methods

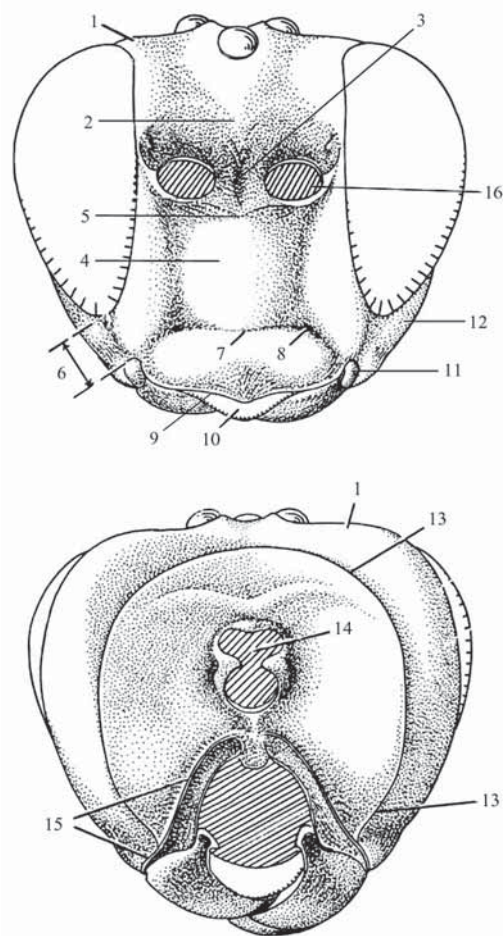
### Specimens

Nearly all of the material for this revision was borrowed from the American Entomological Institute, Gainesville (AEIC). Additional specimens were examined from the following collections: The Academy of Natural Sciences, Philadelphia (ANSP), The Natural History Museum, London (BMNH), Canadian National Collection, Ottawa (CNC), Instituto Nacional de Biodiversidad Collection, San José (INBio), Texas A&M University Entomological Collection, College Station (TAMU), and U. S. National Museum of Natural History (USNM).

### Figures

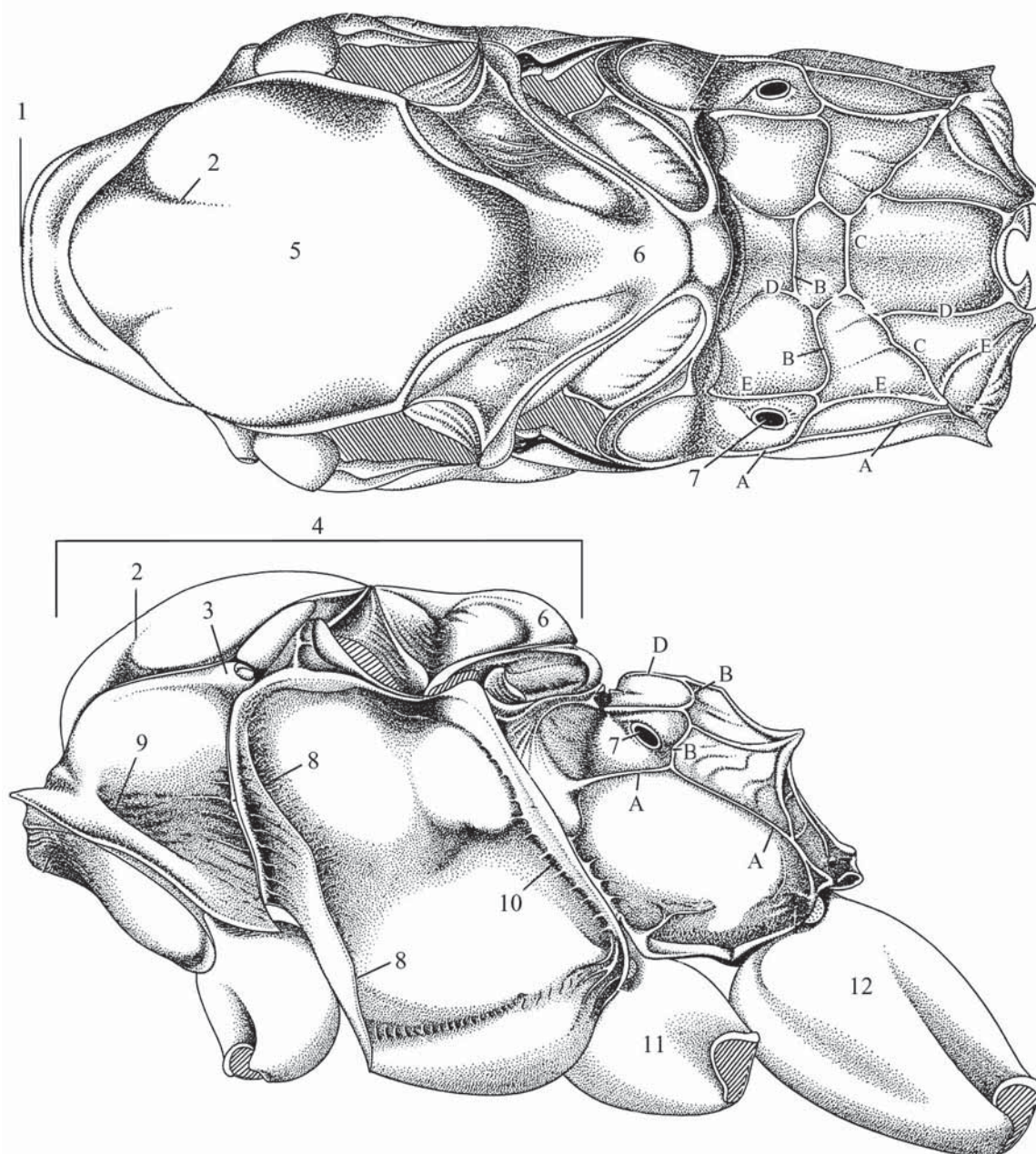
Most images were acquired digitally using Syncroscopy's AutoMontage® software, in combination with a ProgRes 3008 digital camera mounted on a Leica MZ APO dissecting microscope. Figures 1 & 2 are modified from Townes (1969). All images were further processed using various minor adjustment levels in Adobe Photoshop® Elements® 2.0 such as image cropping, image rotation, adjustment of contrast and brightness levels, and color removal. Automontage images are available in color and high resolution at <http://peet.tamu.edu/projects/8/public/site/ich/home>.

Environmental Scanning Electron Microscopy (ESEM) was used for a few of the figures. Specimens for ESEM were mounted on carbon tape and imaged without coating. Brightness and contrast of the ESEM images were also adjusted in Photoshop® Elements® 2.0.



**FIGURE 1.** Head of an ichneumonid (anterior and posterior views). 1, vertex; 2, frons; 3, inter-antennal area (or ridge); 4, face; 5, apical tooth on face; 6, malar space; 7, epistomal suture; 8, anterior tentorial pit; 9, clypeal margin; 10, labrum; 11, mandibular base; 12, gena; 13, occipital carina; 14, foramen magnum; 15, hypostomal carina; 16, torulus.





**FIGURE 2.** Mesosoma of an ichneumonid (dorsal and lateral views). 1, anterior pronotal margin; 2, notauli; 3, lateral corner of pronotum; 4, mesonotum; 5, mesoscutum; 6, scutellum; 7, propodeal spiracle; 8, epicomial carina; 9, lateral groove of pronotum; 10, hind margin of mesopleuron; 11, mesocoxa; 12, metacoxa. A-E, propodeal carinae: A, pleural carina; B, anterior transverse carina; C, posterior transverse carina; D, median longitudinal carina; E, lateral longitudinal carina.

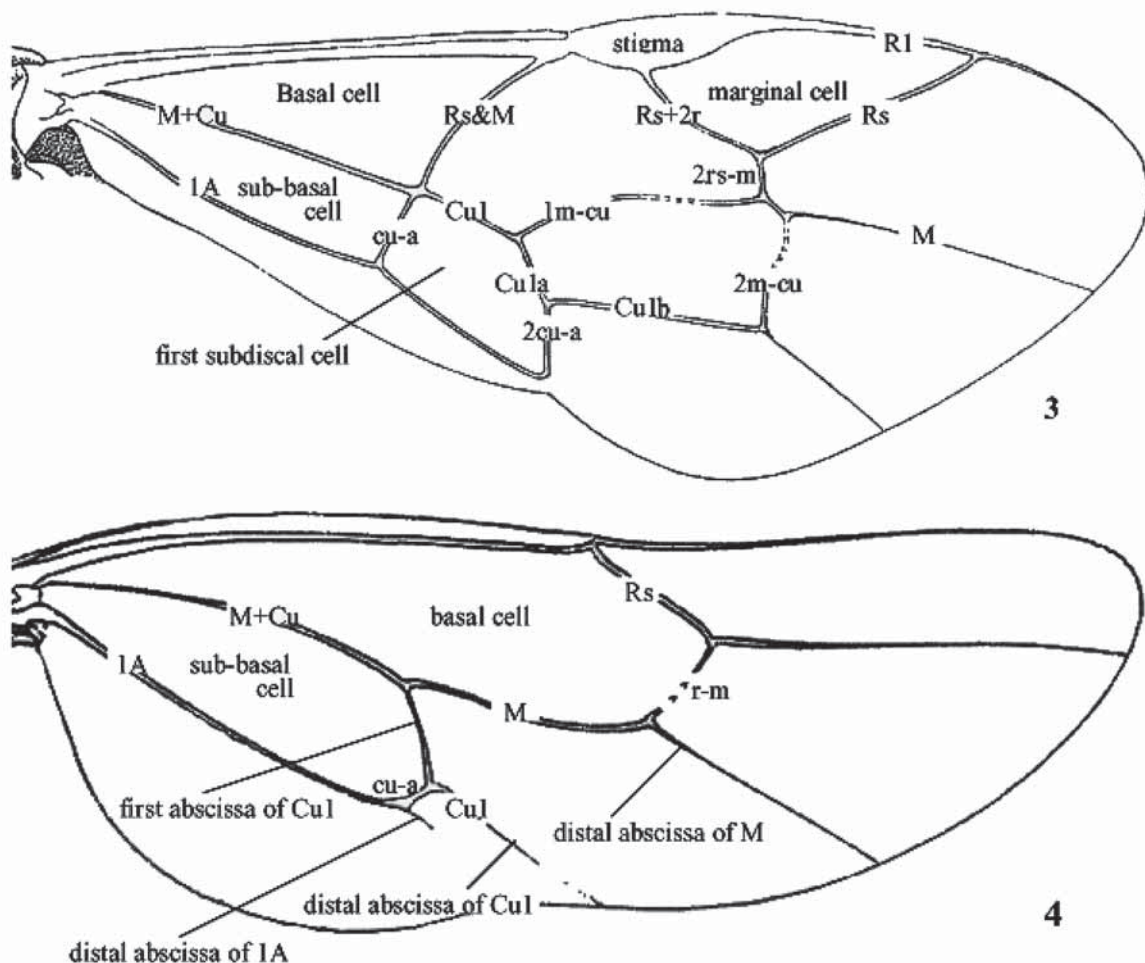
#### Descriptive format and terminology

Most of the terminology used in the descriptions is adapted after Townes (1969, 1970b) and Gauld (1997), with modifications noted in Wharton *et al.* (2008). Where usage varies, or where elaboration may be useful, brief explanations are provided in the following paragraphs. Redescriptions follow the same format as newly described species as far as possible to facilitate comparison. Depending on availability, up to ten paratypes were used for quantitative measurements for newly described species. Diagnoses are presented as a concise combination of diagnostic characters, as no single character is sufficient to diagnose a species. All new taxa described in this work should be attributed solely to the senior author.

In the material examined sections, we use a standard format for paratypes, other material examined (not paratypes), and for specimens of previously described species. Brackets are used to indicate country and state or province when this information is not indicated on the labels or for similarly labeled holotypes. Data on holotypes of newly described species are provided exactly as given on the single data label, with country and state or province indicated in brackets preceding the label data entry. For ease in interpretation of holotype labels, we provide data for each line, delimited by quotation marks for each line. Spacing on data labels is replicated to the best of our abilities. All holotype labels are typed in black ink on white paper with the single exception of *P. gingeus* Zhaurova, **n. sp.**, in which the month and day are hand-printed.

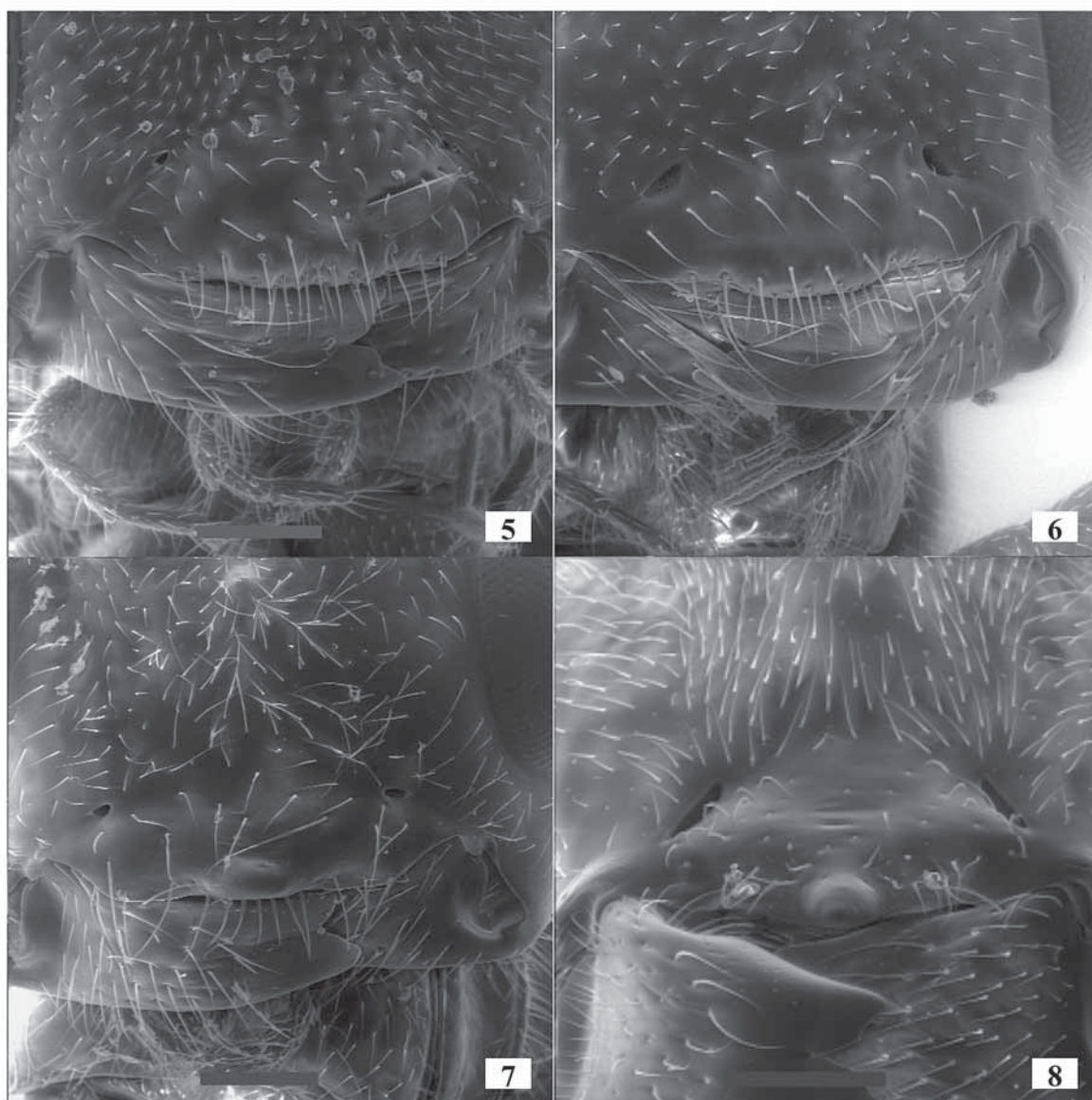
We employ the terms mesosoma (thorax plus propodeum) and metasoma (petiole and following segments) as equivalent to the thorax and abdomen of Townes (1969). Body length, as given in the descriptions, is an approximation of total length because of varying positions of the head and postmortem shriveling of the metasoma.

Head (Fig. 1): Clypeal margin refers to the ventral-most margin of the clypeus. The face is the area between the anterior margin of the toruli and the anterior tentorial pits (thus excluding the clypeus), and is limited by inner eye margins laterally. The face terminates dorsally with an apical tooth or tubercle located just below the level of the toruli. The area between the mandibular base and the anterior eye margin is the malar space (= cheek of Townes 1969). The antennal tyloid on the lateral part of flagellomere 1 is a distinctive patch of placoid sensilla used by Gauld (1984) to characterize his Scolobatini s. l. For measurements, widest transverse diameter of eye refers to the widest horizontal distance between the dorsal and the ventral eye margins in anterior view; width of first flagellomere was measured at mid-length.



FIGURES 3–4. Wings of *Physotarsus*. 3, forewing; 4, hindwing.





**FIGURES 5–8.** ESEM, clypeus. 5, *Physotarsus concavus* n. sp., 6, *P. luteus* n. sp., 7, *P. claviger* n. sp., 8, *Scolobates auriculatus*.

Mesosoma (Fig. 2): The lateral groove of the pronotum, as used in the descriptions, is a distinctly impressed line within the broad, shallowly concave median region of the pronotum in lateral view. The lateral groove of the pronotum originates as a mid-dorsal transverse sulcus on the pronotum and extends laterally on both sides. The epicnemial carina terminates dorsally in a number of different orientations with respect to the anterior margin of the mesopleuron. The dorsal reach of the epicnemial carina is expressed as the proportion of the distance it extends between the ventral-most corner of the pronotum and the lateral corner of the pronotum, e.g. “the epicnemial carina reaches 0.3X the height of pronotum” means that it extends to 0.3X the overall height of the pronotum from its ventral-most corner. Names for propodeal carinae follow Townes (1969), but only two of these are relevant for *Physotarsus*: the pleural carina separating the propodeum laterally from the metapleuron, and one of the longitudinal carinae. The latter is usually completely absent, but is sometimes represented by a short vestige apically. We refer to it as the median longitudinal carina in the descriptions below, but because of the vestigial nature, its exact identity is uncertain.

Wings (Figs 3, 4): Terminology and abbreviations used to describe wing veins and cells largely follow Gauld (1997). Thus, the marginal cell of Gauld (1997) (= radial cell of Townes 1969) is delimited posteriorly

by Rs+2r at the base and Rs at the apex, and anteriorly by the pterostigma (= stigma) and R1. We differ from Gauld (1997) most notably as follows: the distal border of the 1st subdiscal cell is formed by Cu1a anteriorly and 2cu-a posteriorly, with these two intersected by Cu1b. The terms dusky or infumate are used to describe wings that are pale fuscous (= light brownish) and often refers to the fore wing apex. Fuscous is defined as dark brown, approaching black.

**Metasoma:** The tergite of the first metasomal segment (T1) carries the glymma anteriorly. The glymma is situated laterally, immediately ventrad the dorsolateral longitudinal carina. We treat the metasoma as consisting of the petiole (T1 + its sternite, S1), with remaining terga referred to as T2, T3, etc.

## Results and Discussion

### *Physotarsus* Townes, 1966

*Physotarsus* Townes, 1966: 139, 330 (catalog, original description); Townes & Townes 1966: 139 (catalog; new combinations); Townes 1970b: 102–104 (key to genera of Scolobatini, copy of original description); Carlson 1979: 592 (catalog); Gauld 1997: 181–184 (revision of *Physotarsus* of Costa Rica; detailed redescription of genus, illustrated descriptions of 6 new species from Costa Rica); Yu and Horstmann 1997: 455 (catalog).

Type species: *Tryphon maculipennis* Cresson, 1874, by original designation.

**Diagnosis.** Ventral margin of clypeus thickened medially but never with sharply pointed median tooth. Occipital carina absent mid-dorsally, present at least ventrally. First flagellomere with tyloid laterally bearing 15 or fewer sensilla. Fore wing areolet always absent. Hind tarsi swollen, at least in male.

*Physotarsus* lacks the sharply pointed median tooth on the clypeus that characterizes *Scolobates* Gravenhorst and *Onarion* Townes (Figs 5–8), and is therefore most similar to *Catucaba* Graf, Kumagai and Dutra. The apical margin of the clypeus is variously thickened in *Physotarsus* and uniformly thin and sharp in *Catucaba*.

**Description.** Length: body 3.2–9.7 mm, fore wing 3.0–10.4 mm. Clypeus 2.4–4.0X as wide as long; in profile, varying from weakly, evenly convex to flattened medially and somewhat tuberculate laterally, sometimes separated medially by a weak transverse ridge; separated from face dorsomedially by epistomal sulcus that varies from distinctly impressed to barely visible; ventral margin variously thickened, but without sharply pointed median tooth. Anterior tentorial pits oval to slightly elongate with lateromost corners pointed laterad or upcurved. Malar space 0.2–0.8X basal width of mandible; mandible with lower tooth slightly longer than upper; mandible tapering over basal 0.3–0.5, almost parallel-sided apically. Dorsal margin of mandible without distinct median convexity. Mouthparts simple to weakly haustellate, labiomaxillary complex never as elongate as in *Onarion*. Face smooth to deeply and relatively densely punctate, 1.2–2.3X as wide as long, with small median tooth or tubercle dorsally. Interantennal area flat to slightly concave, anterior margin of torulus situated at about 0.6–0.8 of eye height. Widest diameter of torulus 1.0–1.6X widest diameter of median ocellus. Area between lateral ocelli flat to strongly depressed, distance between lateral ocelli 0.4–1.5X their widest diameter, distance from lateral ocellus to eye margin 1.4–2.8X widest diameter of lateral ocellus. Area behind ocelli regularly rounded to sharply declivitous. Antennae with 22–47 flagellomeres, longer to much longer than length of body. First flagellomere with small tyloid laterally, with 15 or fewer sensilla per tyloid; flagellomere length 0.7–1.6X widest transverse diameter of eye, second flagellomere 0.4–0.8X length of first. Occipital carina incomplete, narrowly to broadly effaced dorsally, present on ventral 0.2–0.8 of head, rarely joining hypostomal carina at or before mandibular base, the two carinae often widely separated at mandibular base ventrally but narrowly separated, nearly joining in some species. Pronotum dorsally with distinctly impressed transverse groove, anterior margin truncate to quite strongly emarginate, narrow to exceptionally narrow dorsomedially. Lateral groove of pronotum highly variable, from absent to complete; epomia absent. Pronotum glabrous to variably punctate, sometimes partially rugose. Mesoscutum glabrous to densely punctate, notauli absent. Epicnemial carina extending along ventral 0.2–0.4 of posterior margin of pronotum, sometimes turned towards but only rarely reaching thickened anterior margin of mesopleuron.

Mesopleuron always lightly pubescent ventrally, smooth to densely punctate laterally. Propodeum with pleural carina varying from absent to complete, median longitudinal carinae usually absent, sometimes present as posterior vestiges; punctation variable, usually absent posteromedially, sometimes present anteromedially; punctation always denser laterally than medially. Hind trochanter less than 3.0X as long as basally wide, apical margin of trochanter reaching apical margin of trochantellus. Pretarsus longer than tarsomere 4. Pectination of tarsal claws varying from presence of stout setae only at extreme base to fully or almost fully pectinate. Fore wing without areolet (3rs-m always absent); stigma variable in shape from quite narrow to broadly hemispherical, Rs+2r arising from or more usually distinctly basad midpoint of stigma; marginal cell about 2.5–3.3X as long as wide; 2m-cu with a single bulla; Cu1a about 0.3–1.0X length of 2cu-a. Hind wing with junction of M and rs-m relatively basal; 1st abscissa of Cu1 subequal to distinctly longer than cu-a, the relative lengths often quite variable within species; distal abscissa of 1A usually entirely absent, more rarely present as distinct basal stub (as in the type species). Metasomal T1 about 1.2–2.4X longer than width at apex; flattened to weakly concave anteriorly, usually weakly convex posteriorly; basal depression very shallow to moderately deep at attachment of dorsal tendon, the depression often not delimited posteriorly; dorsomedian longitudinal carinae absent; dorsolateral longitudinal carinae usually present basally, sometimes as a distinct flange over glymma, absent posteriorad spiracle; T1 spiracles sometimes slightly protruding in profile. Glymma present as narrow groove at extreme base, widening somewhat posteriorly ventrad dorsal tendon attachment, not distinctly delimited posteriorly. S1 short to very short, posterior margin extending 0.1–0.4X length of T1. Cerci small, usually sessile or nearly so, never protruding greater than basal width, sparsely setose. Ovipositor short, with deep, broad, subapical notch; sheath usually broader apically than at base, usually sparsely long-setose apically, pattern slightly variable. Color extremely variable; wings largely hyaline, though variously yellow to fuscous in some species; often with dark apical spot.

**Distribution.** Restricted to the New World, occurring from southern Canada to northwestern Argentina and southeastern Brazil. In addition to the North American specimens listed below from Arizona, California, Nebraska, Nevada, New Mexico, and Texas, we have seen several additional specimens from southern U. S. (AEIC, CNC, USNM), including three from Oklahoma and one from North Carolina. We also examined one specimen from Saskatchewan, Canada (CNC), a record that needs verification.

**Biology.** Gauld (1997) provided seasonal and habitat data for the six species he described from Costa Rica. There is only one host record: several specimens of *P. adriani* were reared from cocoons of the argid sawfly *Trochophora lobata* in Costa Rica (Gauld 1997; Janzen 2006).

**Remarks.** The shape of the clypeus is quite variable across its width, with the margin generally thickened medially, thinner and sometimes reflected laterally. The greatest degree of interspecific variation is in the median part of the clypeal margin, with the following states observed: margin evenly convex, weakly and evenly thickened (Fig. 5); margin irregularly thickened, with a distinct, broadly rounded or truncate median lobe (Fig. 6); margin with a narrower, median tooth (Fig. 7) similar to, but not as pointed as, that in the species of *Scolobates* (Fig. 8) and *Onarion*. These states are difficult to describe accurately because they largely represent a continuum of forms across the genus. The shape of the male subgenital plate, as first noted by Gauld (1997), and aedeagus proved useful in discriminating among species that were otherwise similar in appearance. Unfortunately, these features were not always visible and males were unavailable for several species. The name *Physotarsus* is derived from Greek and refers to the inflated hind tarsus of males (Townes 1966), a feature which is also found in other Scolobatini from the New World.

It is apparent from the material available that *Physotarsus* is widely distributed, morphologically diverse, and speciose. During the course of this study, 22 additional morphospecies, each represented by a single specimen, were examined. Phylogenetic analysis is deemed premature due to the inability to score characters, especially for males, for many of the taxa. Lack of males is particularly problematic as our study reveals considerable morphological diversity in male genitalia. Our preliminary attempts to analyze relationships resulted in poorly resolved trees which changed dramatically when additional taxa were added. To facilitate future work, we offer the following observations. The species treated here fall into three groups, with two taxa difficult to place. We propose these as strictly informal species groups in the absence of any specific



analysis of their monophyly. The first group is represented by very large, smooth-bodied species with fuscous wings and pectinate tarsal claws and includes *P. maculipennis* and *P. varicornis* (Cameron). *Physotarsus melipennis* Zhaurova **n. sp.** also has fuscous wings, but is more distinctly punctate and lacks pectinate tarsal claws. It does not fall readily into any of the three groups recognized here. A second group consists of similarly smooth-bodied species all of which have the dorsal tendon attaching within a shallow to moderately deep pit that is discrete and more or less steep-sided distally. All species have the head and mesosoma in various pastel colors and also have fore wings with an apically infumate spot, though this is hard to discern in *P. albus* Zhaurova **n. sp.**, in which the entire wing is weakly infumate. Species included in this second group are *P. adriani* Gauld, *P. albus* Zhaurova **n. sp.**, *P. bonillae* Gauld, *P. glabellus* Zhaurova **n. sp.**, *P. jamesi* Zhaurova **n. sp.**, *P. leucohypopygus* Zhaurova **n. sp.**, *P. oculatus* Zhaurova **n. sp.**, and *P. niveus* Zhaurova **n. sp.** These species are distributed from southern Brazil to Costa Rica and the Lesser Antilles. *Physotarsus claviger* Zhaurova **n. sp.**, from Argentina, is similar but has extensive dark markings on the head and mesosoma. *Physotarsus castilloi* Gauld and *P. eliethi* Gauld, both from Costa Rica, also probably belong here though the nature of the dorsal tendon attachment was not examined. *Physotarsus luteus* is similarly smooth-bodied and resembles several of the smaller species in this second group but the dorsal tendon attachment does not appear to be the same. All remaining species are characterized by distinctly punctate face and mesopleuron, with some species also distinctly punctate on the mesoscutum. The hind femur and tibia are largely to entirely orange in these species. The described species in this third group are distributed from Durango and Nuevo Leon, Mexico to Nebraska and Nevada, USA.

#### Key to species of *Physotarsus* Townes, 1966

- 1 Fore wing weakly (Fig. 9) to strongly (Fig. 44) yellowish or brown to black at base, with (Figs 9, 32) or without (Figs 46, 61) infumate areas apically ..... 2
  - Fore wing hyaline at base (as in Figs. 13, 15) ..... 8
- 2(1) Fore wing evenly colored, entirely infumate/fuscous (Fig. 46) or pale yellowish-brown ..... 3
  - Fore wing not evenly colored (as in Figs 44, 61) ..... 4
- 3(2) Fore wing pale yellowish brown ..... *P. albus* Zhaurova, **n. sp.**
  - Fore wing dark, entirely fuscous ..... *P. melipennis* Zhaurova, **n. sp.**
- 4(2) Basal part of fore wing dark brown to black, apical part variable (Figs 44, 61) ..... 5
  - Basal part of fore wing yellowish, apex infumate (as in Figs 9, 32) ..... 6
- 5(4) Mesosoma dorsally, excluding pronotum, orange; hind femur and tibia orange ..... *P. maculipennis* (Cresson, 1874)
  - Mesosoma dorsally, excluding pronotum, dark brown to black; hind femur and tibia black ..... *P. varicornis* (Cameron, 1886)
- 6(4) Mesosoma with yellow and black markings, face quite densely punctate medially (Fig. 33 ) ..... *P. flavipennis* Zhaurova, **n. sp.**
  - Mesosoma entirely yellowish to light orange, face very lightly evenly punctate (Fig. 28) ..... 7
- 7(6) Frons and first tarsomere of hind leg orange ..... *P. adriani* Gauld, 1997
  - Frons and first tarsomere of hind leg black ..... *P. castilloi* Gauld, 1997
- 8(1) Epicnemial carina strongly turning towards anterior margin of mesopleuron, reaching it or nearly so ..... 9
  - Epicnemial carina largely parallels anterior margin of mesopleuron ..... 14
- 9(8) T1 with apical third white, otherwise largely dark brown; ocellar field entirely black .. *P. oculatus* Zhaurova, **n. sp.**
  - T1 either uniformly colored or dark apically, at most with narrow white apical margin; ocellar field variable, entirely black in some species, not in others ..... 10
- 10(9) T1 entirely yellowish, orange, or light brown, color even ..... 11
  - T1 partly to entirely dark brown ..... 12
- 11(10) T1 2.3X as long as broad ..... *P. eliethi* Gauld, 1997
  - T1 1.2X as long as broad ..... *P. jamesi* Zhaurova, **n. sp.**
- 12(10) Propodeum brown, at least on anterior half ..... *P. niveus* Zhaurova, **n. sp.**
  - Propodeum entirely orange ..... 13

13(12) Clypeus yellowish orange; hind femur dark brown .....	<i>P. leucohypopygus</i> Zhaurova, <b>n. sp.</b>
- Clypeus white; hind femur yellowish orange .....	<i>P. glabellus</i> Zhaurova, <b>n. sp.</b>
14(8) Ventral clypeal margin with a prominent angulate central lobe (Fig. 7) .....	15
- Ventral clypeal margin not as above .....	16
15(14) Body entirely yellowish orange with no brown or black markings .....	<i>P. bonillai</i> Gauld, 1997
- Mesoscutum and face with dark brown markings; anterior half of the propodeum brownish to black .....	<i>P. claviger</i> Zhaurova, <b>n. sp.</b>
16(14) Mesosoma entirely yellow to orange .....	17
- Color of mesosoma variable, but at least partly black .....	19
17(16) Petiole dark brown .....	<i>P. glabellus</i> Zhaurova, <b>n. sp.</b>
- Petiole either pale yellow or dark orange .....	18
18 (17) Petiole pale yellow; antenna abruptly changing from pale to dark subapically .....	<i>P. luteus</i> Zhaurova, <b>n. sp.</b>
- Petiole dark orange; antenna mostly dark throughout, without abrupt color change .....	<i>P. jamesi</i> Zhaurova, <b>n. sp.</b>
19(16) Face quite strongly protruding medially (Figs 49, 55) .....	20
- Face not to very weakly protruding medially (Fig. 24) .....	23
20(19) Mesoscutum largely impunctate posteriorly, very sparsely punctate anteriorly .....	<i>P. gineus</i> Zhaurova, <b>n. sp.</b>
- Mesoscutum densely punctate anteriorly and posteriorly .....	21
21(20) Mesoscutum black with anterolateral margin pale yellowish; fore and mid femora partially black .....	<i>P. tunicus</i> Zhaurova, <b>n. sp.</b>
- Mesoscutum black with anterolateral margin and most or all of notaular lines pale to dark yellow; fore and mid femora yellowish .....	22
22(21) Mesopleuron entirely black; face yellowish laterally, black medially .....	<i>P. foveatus</i> Zhaurova, <b>n. sp.</b>
- Mesopleuron black with yellow markings; face entirely yellowish .....	<i>P. melotarsus</i> Zhaurova, <b>n. sp.</b>
23(19) Mesopleuron and mesoscutum entirely black .....	<i>P. montezuma</i> (Cameron, 1886)
- Mesopleuron usually and mesoscutum always with at least some yellow .....	24
24(23) Tarsomeres 3 and 4 of hind leg bright yellow, much lighter than tarsomeres 1 and 5. Male subgenital plate slightly emarginate (Fig. 22) .....	<i>P. concavus</i> Zhaurova, <b>n. sp.</b>
- Tarsomeres of hind leg uniformly orange or brown or grading from orange to brown. Male subgenital plate deeply emarginate (Figs 25, 31, 59) .....	25
25(24) Tarsomeres of hind leg distinctly infumate, at least dorsally. Antenna mostly dark brown over apical half, often with somewhat indistinct whitish subapical ring .....	<i>P. emarginatus</i> Zhaurova, <b>n. sp.</b>
- Tarsomeres of hind leg orange. Antenna mostly orange to yellow orange over apical half, with apical flagellomeres contrastingly darker .....	26
26(25) Mesoscutum with a narrow anterolateral yellow margin with yellow extending posteriorly along notaular line (Fig. 26); male subgenital plate deeply emarginate, cordate (Fig. 25) .....	<i>P. cordatus</i> Zhaurova, <b>n. sp.</b>
- Mesoscutum with anterolateral margin usually black, never with yellow on notaular line (Fig. 60); male subgenital plate deeply emarginate, inner margin not protruding (Fig. 59) .....	<i>P. truncatus</i> Zhaurova, <b>n. sp.</b>

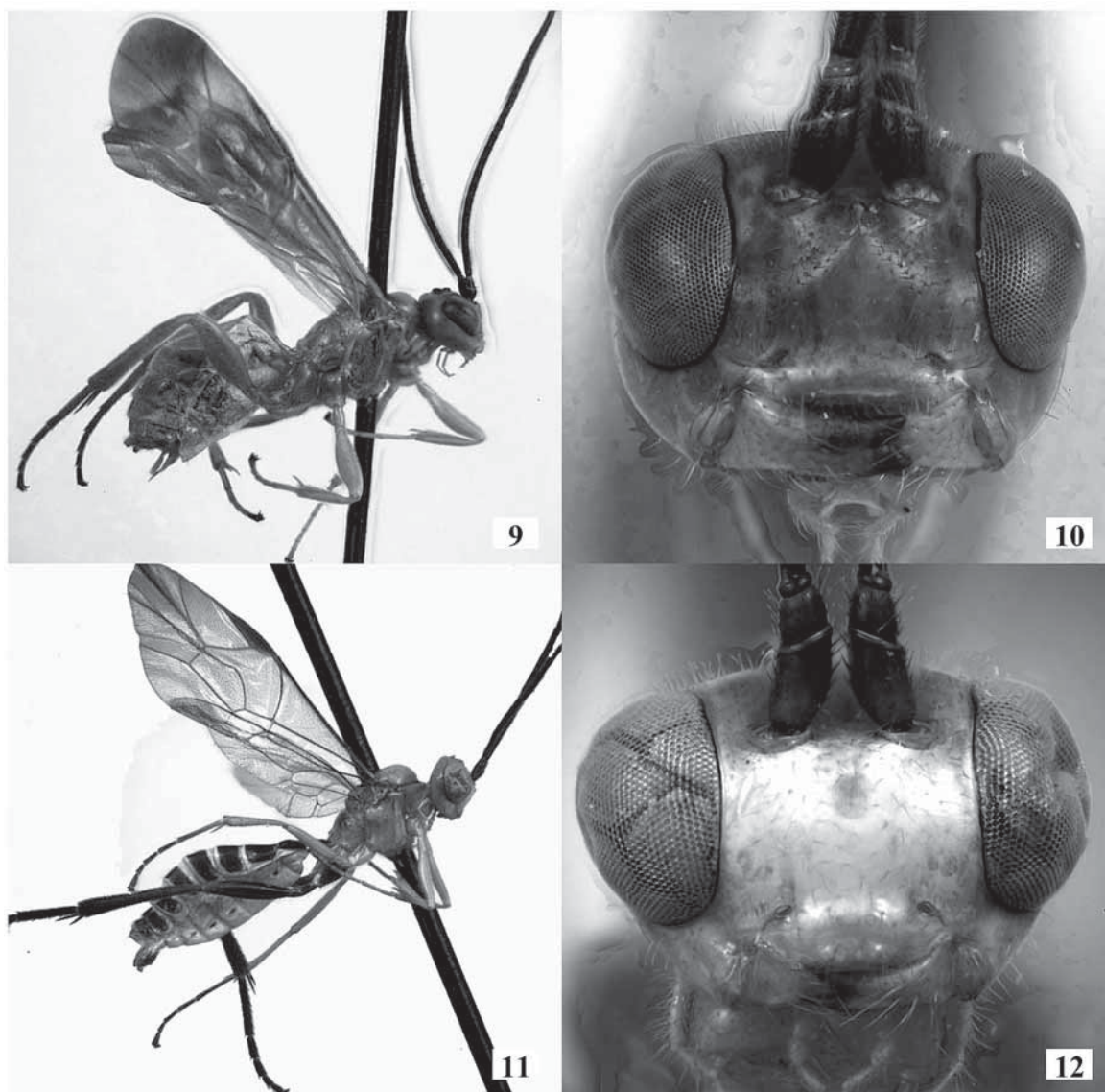
### ***Physotarsus adriani* Gauld, 1997 (Figs 9, 10)**

*Physotarsus adriani* Gauld, 1997: 194–195. Holotype ♀ in INBio.

*Physotarsus adriani*: Yu & Horstmann 1997: 455 (catalog).

**Diagnosis.** Lateral ocelli separated by 0.4–0.6X their widest diameter from each other and about 1.8–2.1X their widest diameter from eye margin. Antenna with 30–32 flagellomeres. Pronotum and mesoscutum glabrous, impunctate. T1 about twice as long as broad. Head brownish orange, face mostly brown. Mesosoma and metasoma orange. Hind legs orange, tarsomeres distally infusate. Fore wing very strongly yellowish proximally, blackish infumate distally.

*Physotarsus adriani* is readily recognized by the distinctive color pattern of the fore wing, matched only in *P. castilloi*. The two are distinguished by color differences noted in the key above and in Gauld (1997), and in the shape of the ventral margin of the clypeus which is not as strongly protruding in *P. adriani*.



**FIGURES 9–12.** Habitus and face. 9–10, *Physotarsus adriani* n. sp.; 9, habitus; 10, face. 11–12, *P. albus* n. sp.; 11, habitus; 12, face.

*Description. Female:* Body (Fig. 9) 4.8–6.2 mm, fore wing 4.6–7.0 mm. Head (Fig. 10): Clypeal margin widely truncate laterally, with thick, somewhat angulate central lobe. Clypeus flattened medially, about 3.6x as wide as long, divided medially by shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.4–0.5X width of mandibular base. Face 1.3X as broad as long, weakly bulging dorsomedially, evenly sparsely punctate. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.3x widest diameter of median ocellus. Lateral ocelli separated by 0.4–0.6X their widest diameter from each other and about 1.8–2.1X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli sharply declivitous. Antenna with 30–32 flagellomeres, first flagellomere 3.6–4.2X longer than wide, 1.4X widest transverse diameter of eye, second flagellomere 0.7–0.8X length of first. Occipital carina present on ventral 0.2–0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and upcurved. Lateral groove of pronotum vestigial, present on dorsal 0.1, sometimes absent entirely. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron



impunctate, sparsely pubescent ventrally. Metapleuron pubescent, more sparsely so posteromedially. Propodeum without carinae; impunctate medially, pubescent anterolaterally. Tarsal claws simple. Fore wing stigma narrow, about 4.2X longer than wide; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 2.6–2.9X longer than wide; 2rs-m usually 1.6–1.7X (1.3x in one specimen) longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.5–0.7X length of 2cu-a; cu-a interstitial to weakly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.0–1.2X length of rs-m; 1st abscissa of Cu1 about 3.0–4.0X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored within small, relatively discrete depression; spiracles protruding in profile; dorsolateral carina extending about half distance to spiracle. Cerci distinct, round to slightly ovate, nearly flat.

*Male*: Similar to female in structure and color; subgenital plate with very broad U-shaped incision in posterior margin.

*Color*. Head brownish orange, face mostly brown. Antenna black. Mesosoma and metasoma orange, ventrally grading to yellowish. Fore and mid legs yellowish; hind legs orange, with tarsomeres distally infusate. Fore wing very strongly yellowish proximally, blackish infumate distally; stigma usually pale orange-brown, rarely blackish.

*Material Examined*. Paratypes: 6 ♀ 1 ♂ COSTA RICA: Guanacaste Prov., Santa Rosa National Park, 300 m, 13.vi.1976 & 10.vi–1.vii.1977 (Janzen) (AEIC); 3 ♀ Guanacaste National Park, Finca Jenny, vi.1990 (INBio).

*Remarks*. Gauld (1997) noted that this was the most frequently collected species of *Physotarsus* in Costa Rica, though it was only found in the seasonal dry forests of northwestern Guanacaste. Specimens were collected only in June and July, shortly after the start of the wet season, but one sample of parasitized host larvae was collected in late May from new foliage (Janzen 2006, Voucher code: 88-SRNP-67). Following cocoon formation, three of the host sawflies eclosed in June but parasitoids did not emerge until November, at the end of the wet season (Janzen 2006). Janzen (2006) noted that one parasitoid emerged from each cocoon, cutting a round hole through the side of the cocoon.

Gauld (1997) based his description on 3 ♂ 25 ♀, with the holotype and several paratypes from Guanacaste National Park, Finca Jenny. A species nearly identical to *P. adriani* occurs Brazil but was represented in the AEIC by only a single specimen. The difference in distribution makes it unlikely to be the same species, but since there is only a single specimen, we are reluctant to describe it as new.

### ***Physotarsus albus* Zhaurova, n. sp. (Figs 11, 12)**

*Diagnosis*. Lateral ocelli separated by about 0.5x their widest diameter from each other and about 2.0X their widest diameter from eye margin. Antenna with 24–26 flagellomeres. Pronotum and mesoscutum impunctate, shiny. T1 3.0X as long as broad. Face white; frons and occiput orange. Mesosoma orange, area around propodeal spiracles sometimes brown. Metasomal tergites brown with narrow, white lateral and apical margins, sternites white. Hind leg almost entirely dark brown to black. Fore wing very lightly and evenly infumate, nearly hyaline.

*Physotarsus albus* is readily recognized by the uniformly lightly colored wing and contrastingly white face and clypeus on an orange head. No other species has the same color pattern on the fore wing. *Physotarsus leucohypopygus*, similar in size and body sculpture, also known only from Brazil, has a uniformly colored head and hyaline wings with fuscous spot at apex. The wing of *P. flavipennis* is somewhat similar, but with a dark apical spot and *P. flavipennis* is distinctly punctate on the face, frons, and mesopleuron.

*Description*. *Male*: Body (Fig. 11) 5.0–5.5 mm, fore wing 5.0–5.4 mm. Head (Fig. 12): Clypeal margin widely rounded laterally, with thick, somewhat angulate central lobe. Clypeus about 3.0X as wide as long, not divided medially by shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits oval. Malar space 0.6–0.8X width of mandibular base. Face about 1.5–1.6X as

broad as long, weakly convex, smooth, impunctate. Interantennal area slightly concave, area immediately behind antenna weakly concave, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.1X widest diameter of median ocellus. Lateral ocelli separated by about 0.5X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Area between lateral ocelli flat to slightly depressed, area behind ocelli sharply declivitous. Antenna with 24–26 flagellomeres, first flagellomere 6.2–6.7X longer than wide, about equal widest transverse diameter of eye, second flagellomere about 0.7X length of first. Occipital carina present on ventral 0.4 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally truncate and strongly upcurved. Lateral groove of pronotum absent entirely or short and crenulate on dorsal 0.1. Pronotum and mesoscutum impunctate, shiny. Epicnemial carina turning towards but never reaching anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Metapleuron pubescent, more sparsely so posteromedially. Propodeum with posterior vestiges of median longitudinal and pleural carinae; impunctate medially, sparsely punctate laterally. All tarsal claws pectinate. Fore wing stigma narrow, about 4.5X longer than wide; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 2.8X longer than wide; 2rs-m 0.8–2.0X length of abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a interstitial to weakly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.0–1.2X length of rs-m; 1st abscissa of Cu1 0.9–1.5X longer than cu-a. Metasoma: T1 3.0X as long as broad; surface undulating: flatter medially, weakly elevated anteriorly and posteriorly; dorsal tendon anchored within deep, discrete depression; spiracles protruding in profile; dorsolateral carina extending about half distance to spiracle. Cerci distinct, round to slightly ovate, nearly flat. Male subgenital plate prominent, its posterior margin shallowly concave.

*Color.* Face white, frons and occiput orange. Antenna dark brown to black. Mesosoma orange, area around propodeal spiracles sometimes brown. Metasomal tergites brown with very thin white margins, sternites white. Fore and mid legs yellowish, apex sometimes dark; hind leg dark brown to black, except coxa usually orange ventrally, posteriorly, and at base. Fore wing entirely pale yellowish brown.

*Female:* Unknown.

*Material Examined.* Holotype ♂ (AEIC, Type No. 3847): [BRAZIL, São Paulo] first line of data label: “Serra da Bocaina” second line: “1600m. S. J. Barreiros” third line: “XI. 4–7. 1967 Brazil” fourth line: “Alvarenga & Seabra”. Paratypes: 1 ♂, same data as holotype (AEIC); 8 ♂, same data except 1650 m, xi.1968 (AEIC, TAMU).

*Remarks.* This species was collected at relatively high elevations, from 1600–1650 m and is known only from southwestern Brazil.

The species name is Latin for white, referring to the white face.

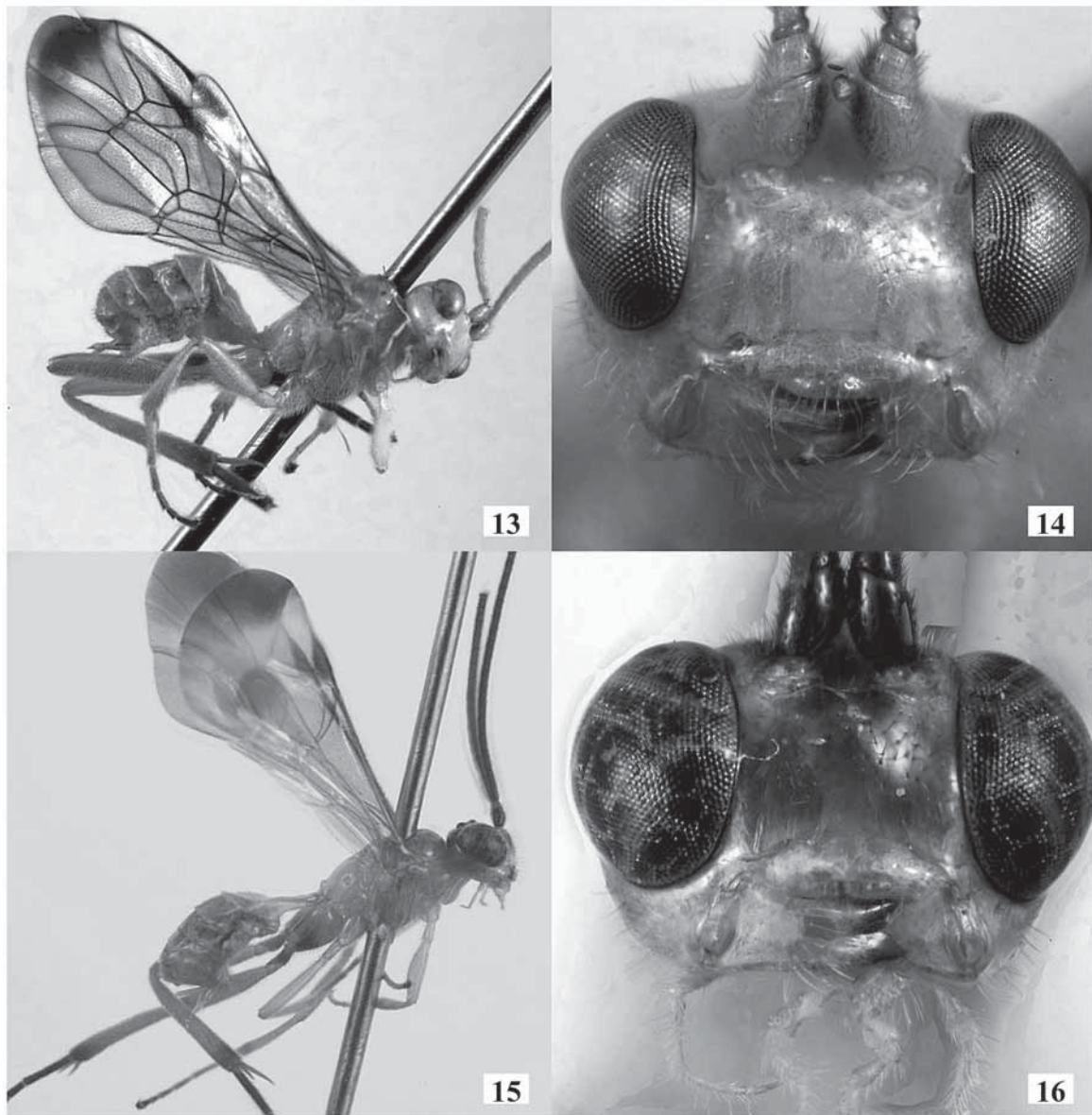
### ***Physotarsus bonillai* Gauld, 1997 (Figs 13, 14)**

*Physotarsus bonillai* Gauld, 1997: 195–196. Holotype ♀ in INBio.

*Physotarsus bonillai*: Yu & Horstmann, 1997: 455 (catalog).

*Diagnosis.* Lateral ocelli separated by 0.7–0.8X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Antennae with 26–27 flagellomeres. Pronotum and mesoscutum glabrous, impunctate. T1 about 1.5X as long as broad. Head entirely pale yellowish. Mesosoma and metasoma yellowish. Hind legs pale orange, with tarsomeres uniformly infusate. Fore wing hyaline, apex infumate.

This species is most similar to *P. claviger* and *P. castilloi* in body sculpture and form of the clypeal margin. The head and body of *P. bonillai* are completely pale whereas *P. castilloi* has darker markings on the head and *P. claviger* has extensive dark markings on head and body. The petiole is also much broader in *P. bonillai*.



**FIGURES 13–16.** Habitus and face. 13–14, *Physotarsus bonillai*; 13, habitus; 14, face. 15–16, *P. castilloi*; 15, habitus; 16, face.

*Description. Female:* Body (Fig. 13) 4.3–5.0 mm, fore wing 3.5–5.0 mm. Head (Fig. 14): Clypeal margin widely truncate laterally, with thick, somewhat angulate central lobe. Clypeus about 3.8X as wide as long, divided medially by shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.5–0.6X width of mandibular base. Face 1.8X as broad as long, weakly convex, nearly flat, evenly sparsely punctate. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.2X widest diameter of median ocellus. Lateral ocelli separated by 0.7–0.8X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli sharply declivitous. Antennae with 26–27 flagellomeres, first flagellomere 3.9–4.7X longer than wide, 1.1X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first. Occipital carina present on ventral 0.2–0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and upcurved. Lateral groove of pronotum



unsculptured, present on dorsal 0.4. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Metapleuron pubescent, more sparsely so posteromedially. Propodeum with vestige of pleural carina; impunctate medially, pubescent laterally. Tarsal claws basally usually with stout setae. Fore wing stigma narrow, about 4.8–4.9X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 2.6–2.8X longer than wide; 2rs-m 1.6–2.2X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4–0.6X length of 2cu-a; cu-a weakly to distinctly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.2–1.4X longer than rs-m; 1st abscissa of Cu1 1.5–2.0X longer than cu-a. Metasoma: T1 about 1.5X as long as broad; surface in profile almost completely flat; dorsal tendon attached to almost flat surface; spiracles protruding in profile; dorsolateral carina extending about 0.3–0.4X distance to spiracle. Cerci distinct, round to slightly ovate, nearly flat.

*Male*: Subgenital plate with narrow, V-shaped incision in posterior margin. Otherwise similar to female in structure and color.

*Color*. Head entirely pale yellowish; antenna with scape and pedicel ventrally yellow, infusate dorsally. Flagellum proximally yellowish brown, darker dorsally, grading to entirely black apically. Mesosoma and metasoma pale yellowish. Fore and mid legs yellowish, hind legs orange, with tarsomeres uniformly infusate. Fore wing hyaline, apex infumate; stigma black.

*Material Examined*. Paratypes: 2 ♀ COSTA RICA, Guanacaste Prov., Santa Rosa National Park, 3 & 14.xii.1977 (Janzen) (AEIC); 4 ♀ 1 ♂, same locality, 3–24.viii.1985 & 6–27.ix.1986 (Janzen & Gauld) (BMNH, INBio).

*Remarks*. As with *P. adriani*, *P. bonillai* has been collected almost exclusively in the seasonally dry forests of northwestern Guanacaste (Gauld 1997). Most specimens were collected during the wet season, from June through October, but two specimens (noted above) were taken in December.

Gauld (1997) based his description on the above material plus five additional females, one of which was taken in San Jose Province.

### ***Physotarsus castilloi* Gauld, 1997 (Figs 15, 16)**

*Physotarsus castilloi* Gauld, 1997: 196–197. Holotype ♀ in INBio.

*Physotarsus castilloi*: Yu & Horstmann 1997: 455 (catalog).

*Diagnosis*. Lateral ocelli separated by 0.5–0.6X their widest diameter from each other and about 1.6–1.7X their widest diameter from eye margin. Antenna with 30–32 flagellomeres. Pronotum and mesoscutum glabrous, impunctate. T1 about twice as long as broad. Head orange-brown with face infusate medially and vertex entirely black. Mesosoma and metasoma orange, ventrally grading to yellowish. Hind legs orange with coxa and trochanter distally infusate, tarsomeres entirely black. Fore wing very strongly yellowish, distally blackish infumate.

This species is most similar to *P. claviger* and *P. bonillai* in body sculpture and form of the clypeal margin. The fore wing of *P. castilloi* is distinctly yellow, with the apex infumate, similar to *P. adriani*, whereas the base of the wing is hyaline in *P. bonillai* and *P. claviger*.

*Description. Female*: Body (Fig. 15) 5.0–5.7 mm, fore wing 5.3–6.0 mm. Head (Fig. 16): Clypeal margin widely truncate laterally, with thick, somewhat angulate central lobe. Clypeus about 4.0X as wide as long, divided medially by transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.3–0.4X width of mandibular base. Face 1.4X as broad as long, nearly flat, evenly sparsely punctate. Interantennal area slightly concave, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than the distance between lateral ocelli. Widest diameter of torulus 1.1x widest diameter of median ocellus. Lateral ocelli separated by

0.5–0.6X their widest diameter from each other and about 1.6–1.7X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli sharply declivitous. Antenna with 30–32 flagellomeres, first flagellomere about 4.0X longer than wide, 1.3X widest transverse diameter of eye, second flagellomere 0.6X length of first. Occipital carina present on ventral 0.2–0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and upcurved. Lateral groove of pronotum present on dorsal 0.2. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Propodeum with vestige of pleural carina; impunctate medially, pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow; marginal cell about 2.5–2.6X longer than wide; Cu1a about 0.6–0.7X length of 2cu-a. Hind wing M+Cu strongly bowed. Metasoma: T1 about 2.0X as long as broad surface in profile largely flat; spiracles protruding in profile. Cerci not protruding.

*Male*: Subgenital plate with very broad but basically V-shaped incision in posterior margin. Otherwise similar to female in structure and color.

*Color*. Head orange-brown with face infusate medially and vertex entirely black. Antenna entirely black. Mesosoma and metasoma orange, ventrally grading to yellowish. Fore and mid legs yellowish. Hind legs orange with coxa and trochanter distally infusate, hind tarsomeres entirely black. Fore wing very strongly yellowish, distally blackish infumate; stigma black.

*Material examined*. Paratypes: COSTA RICA, Puntarenas Prov., Golfo Dulce Forest Reserve, 1 ♀ 10 km W of Pan American Highway on road to Rincon de Osa, 100 m, iii-iv.1989 (Gauld) (BMNH), 1 ♂ 24 km W of Pan American Highway on road to Rincon de Osa, 200 m, ii.1990 (Gauld) (BMNH).

*Remarks*. Gauld (1997) described this species from three specimens, two females and a male, all from dense primary wet forest along the road to Rincon de Osa. Gauld (1997) also noted that this was the only species of Costa Rican *Physotarsus* from wet forests on the Pacific lowlands, though *P. eliethi* is found in a similar habitat on the Atlantic side. Gauld (1997) noted that *P. castilloi* closely resembles *P. adriani*.

### ***Physotarsus claviger* Zhaurova, n. sp. (Figs 7, 17–19)**

*Diagnosis*. Lateral ocelli separated by about 0.7X their widest diameter from each other and 1.7X their widest diameter from eye margin. Antenna with 28 flagellomeres. Pronotum and mesoscutum glabrous, impunctate. T1 about 1.7X as long as broad. Head yellow and dark brown to black, face yellow with median longitudinal dark brown stripe and transverse band ventrally extending partly onto clypeus. Mesosoma with yellow and black markings. Metasomal tergites largely black with thin yellow apical trim, sternites yellow. Hind femur almost entirely dark brown to black, hind tibia largely yellow with dark patch or patches near apex, tarsomeres yellow, pretarsus black. Fore wing hyaline, apex infumate.

This species is most similar to *P. bonillai* and *P. castilloi* in body sculpture and form of the clypeal margin, but is much darker in coloration. *Physotarsus claviger* is the only described species with extensive dark markings on the mesothorax and a virtually impunctate mesopleuron.

*Description*. *Male*: Body (Fig. 17) 5.0 mm, fore wing 5.7 mm. Head (Fig. 18): Clypeal margin undulate laterally with thick, angulate central lobe (Fig 7). Clypeus about 2.7–3.0X as wide as long, divided medially by very shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits deep, elongate and pointed laterally. Malar space about 0.6X width of mandibular base. Face 2.0X as broad as long, nearly flat, evenly sparsely punctate. Interantennal area flat, area immediately behind antennae weakly concave turning convex laterally and medially before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.5X widest diameter of median ocellus. Lateral ocelli separated by about 0.7X their widest diameter from each other and 1.7X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 28 flagellomeres, first flagellomere 5.0X longer than wide, 1.6X widest transverse diameter of eye, second

flagellomere 0.7X length of first. Occipital carina present on ventral 0.3–0.4 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum vestigial, unsculptured, present on dorsal 0.3. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Metapleuron pubescent, a little more sparsely so posteromedially. Propodeum with pleural carina complete; widely impunctate medially, sparsely pubescent and somewhat rugose laterally. Tarsal claws with stiff setae basally. Fore wing stigma narrow; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.0X longer than wide; 2rs-m 1.3–1.5X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.8X length of 2cu-a; cu-a distinctly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.4X longer than rs-m; 1st abscissa of Cu1 about 3.0–4.0X longer than cu-a. Metasoma: T1 about 1.8X as long as broad; surface in profile almost completely flat, dorsal tendon anchored within small, shallow, relatively discrete depression; spiracles strongly protruding; dorsolateral carina extending medially from spiracle and more than half distance to level of spiracle from the base. Cerci weakly protruding. Subgenital plate narrowly emarginate, fairly deep, its margin even. Aedeagal margin toothed laterally (Fig. 19).

*Color.* Head largely yellow with median longitudinal dark brown stripe and transverse band ventrally extending partly onto clypeus, longitudinal and transverse bands may combine to form a smooth triangle, vertex and ocellar field dark brown to black. Mesosoma with yellow and black markings, mesopleuron except dorsally, entire metapleuron, and all but extreme apex of propodeum black. Metasomal tergites largely black with a thin yellow trim, sternites yellow. Fore and mid legs yellow, hind femur black except yellow at extreme apex, hind tibia largely yellow with dark patch or patches near apex, tarsomeres yellow, pretarsus black. Fore wing hyaline, apex infumate.

*Female:* Similar to male except first flagellomere 4.5X longer than wide; cu-a of fore wing interstitial; hind wing Rs 1.2X longer than rs-m.

*Material Examined.* Holotype ♂ (AEIC, Type No. 3848): [ARGENTINA, Tucumán] first line of data label: “Villa Nogués” second line: “I-1-66 Argent.” third line: “H. & M. Townes”. Paratypes: 1 ♀ 1 ♂, same data as holotype (AEIC).

*Remarks.* The species name is Latin for club-bearing, referring to the shape of the clypeal margin. This species is known only from northwestern Argentina. This is *Physotarsus* species 4 in the analyses conducted by Zhaurova and Wharton (2009).

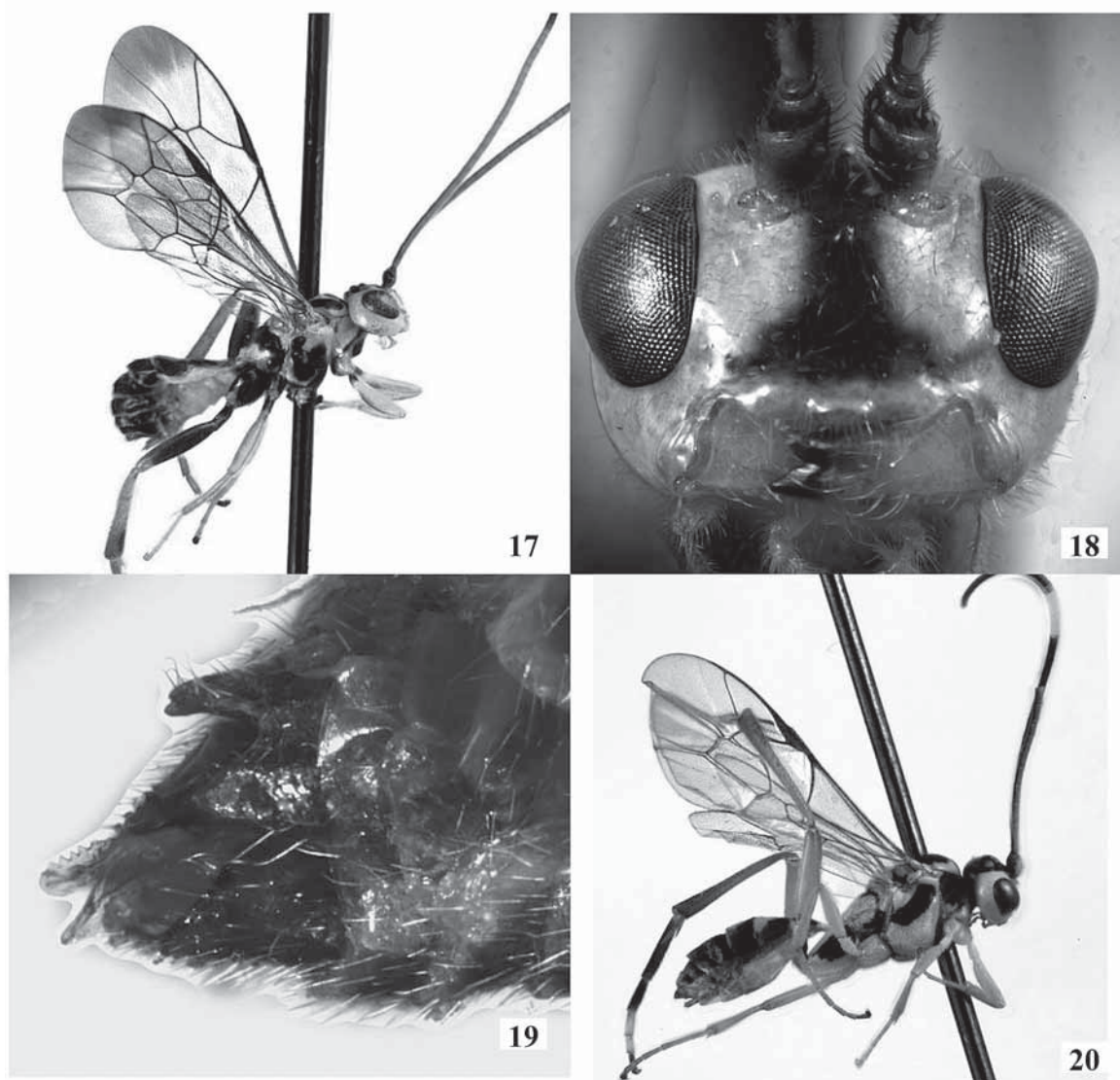
### ***Physotarsus concavus* Zhaurova, n. sp. (Figs 5, 20–22)**

*Diagnosis.* Lateral ocelli separated by 1.1–1.2X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Antennae with 33–42 flagellomeres. Pronotum completely glabrous. Mesoscutum shiny, very sparsely punctate on anterior 0.3. T1 about twice as long as broad. Head yellow with broad, black median stripe extending from base of antenna through vertex; occiput almost completely black. Mesosoma black and yellow (Fig. 20). T1 yellow basally with two black bands extending from spiracle to or nearly to apex; T2 and often T3 with yellow triangular patch medially, otherwise dark brown to black, remaining tergites largely dark laterally, variously yellow to orange medially. Hind femur and tibia orange, tarsomeres 1 and 2 brown, tarsomeres 3 and 4 usually yellow, sometimes only ventrally. Fore wing entirely hyaline.

*Physotarsus concavus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a sparsely to impunctate mesoscutum. It is nearly identical to *P. cordatus*, *P. emarginatus*, and *P. truncatus*. but differs from these in the possession of distinctly pale middle tarsomeres on the hind leg. The subapical ring on the flagellum is also more distinct in *P. concavus*.

*Physotarsus concavus* is very similar in color to *P. emarginatus*, and to a lesser extent *P. cordatus*. The hind tarsi are darker in *P. emarginatus* and the dorsoposterior corner of the mesopleuron is black, while in *P. cordatus* the hind legs and metasoma are more extensively orange. *Physotarsus concavus* differs from both of these species in the more shallowly concave male subgenital plate.





**FIGURES 17–20.** Habitus, face, and male genitalia. 17–19, *Physotarsus claviger* n. sp.; 17, habitus; 18, face; 19, male genitalia, ventral view. 20, *P. concavus* sp. nov., habitus.

*Description. Female:* Body (Fig. 20) 4.2–5.9 mm, fore wing 3.8–5.3 mm. Head (Fig. 21): Clypeal margin thick, evenly rounded laterally with thick, rounded central lobe. Clypeus (Fig. 5) about 2.6–2.7X as wide as long, divided medially by very shallow transverse depression. Face covered with very short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.4–0.5X width of mandibular base. Face 1.8–1.9X as broad as long, slightly protruding in profile, sparsely punctate laterally, more densely punctate medially. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.3X widest diameter of median ocellus. Lateral ocelli separated by 1.1–1.2X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antennae with 33–42 flagellomeres, first flagellomere 5.5–6.6X longer than wide, 1.3X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first. Occipital carina present on ventral 0.6 of head. Mesosoma: Anterior margin of pronotum medially very slightly emarginate, laterally rounded, slightly upcurved. Lateral groove of pronotum well-developed, sculptured, extending over dorsal 0.8, sometimes complete to ventroposterior margin. Pronotum completely glabrous, impunctate. Mesoscutum shiny, very sparsely punctate on anterior 0.3. Epicnemial carina parallels

anterior margin of mesopleuron. Mesopleuron punctate, with prominent shiny spot. Metapleuron evenly setose. Propodeum with at least posterior vestige of pleural carina; impunctate medially, moderately densely punctate and pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, about 4.0X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.0X longer than wide; 2rs-m usually 1.6–2.4X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.5–0.6X length of 2cu-a; cu-a interstitial to antefurcal relative to Rs&M, most commonly distinctly antefurcal. Hind wing M+Cu bowed; basal abscissa of Rs approximately equal length of rs-m; 1st abscissa of Cu1 1.2–1.7X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; with shallow median groove basally fading to flat surface at level of spiracle, moderately convex posteriorly; spiracles not strongly protruding; dorsolateral carina extending 0.5–0.6X distance to spiracle. Cerci distinct, round to slightly ovate, nearly flat.

*Male*: Subgenital plate not emarginate, its margin even (Fig. 22). Aedeagal margin not toothed. Otherwise similar to female in structure and color except first flagellomere 6.0–7.2X longer than wide, and ratios for quantitative characters in hind wing much more variable.

*Color*. Head yellow with broad, black median band extending from base of antenna through vertex; occiput almost completely black, black band usually extending anteriorly as narrow stripe to facial tubercle. Antenna usually with 3–4 yellow flagellomeres subapically, occasionally with one or two more, basal and apical members of subapical ring often partly brownish; flagellum otherwise dark brown to black dorsally, brown to light brown ventrally basad subapical ring. Mesosoma black and yellow, with pronotum almost completely black, scutellum yellow, propodeum mostly yellow with black transverse band along anterior margin narrower medially than laterally, mesopleuron largely yellow with broad, black, somewhat diagonal band extending from ventral margin of subalar ridge through mesopleural fovea. T1 yellow basally with two black bands extending from spiracle to or nearly to apex, bands sometimes partially coalescing posteriorly; T2 and often T3 with yellow triangular patch medially, otherwise dark brown to black, remaining tergites largely dark laterally, with varying amounts of yellow to orange medially; cerci light-brown. Fore and mid legs mostly yellow, including coxae, with femora and tibiae sometimes pale orange and apical tarsomeres of mid leg sometimes brown. Hind coxa yellow with broad black band laterally, trochanter and trochantellus largely black, femur and tibia usually extensively orange, tarsomeres 1, 2, and 5 usually dark brown; tarsomeres 3 and 4 usually yellow, sometimes only ventrally. Fore wing entirely hyaline.

*Material Examined*. Holotype ♀ (AEIC, Type No. 3849): [USA, Arizona] first line of data label: “Portal, Ariz.” second line: “IX.3.1974” third line: “H.&M. Townes”. Paratypes: 2 ♀ 1 ♂, same data as holotype (AEIC); 19 ♀ 10 ♂, same data as holotype except dates ranging 13.viii–7.ix.1974, 23.viii.1987 & 18.ix.1987 (AEIC, TAMU); Arizona, 4 ♀ 4 ♂ Parker Canyon Lk., 22–24.viii.1974 (H&M Townes) (AEIC, TAMU), 1 ♂ Nogales, 22.viii.1974 (H&M Townes) (AEIC); 1 ♂ MEXICO, Nuevo Leon, San Pedro Iturbide, 32 km W. Linares, 6.x.1962 (H&M Townes) (AEIC).

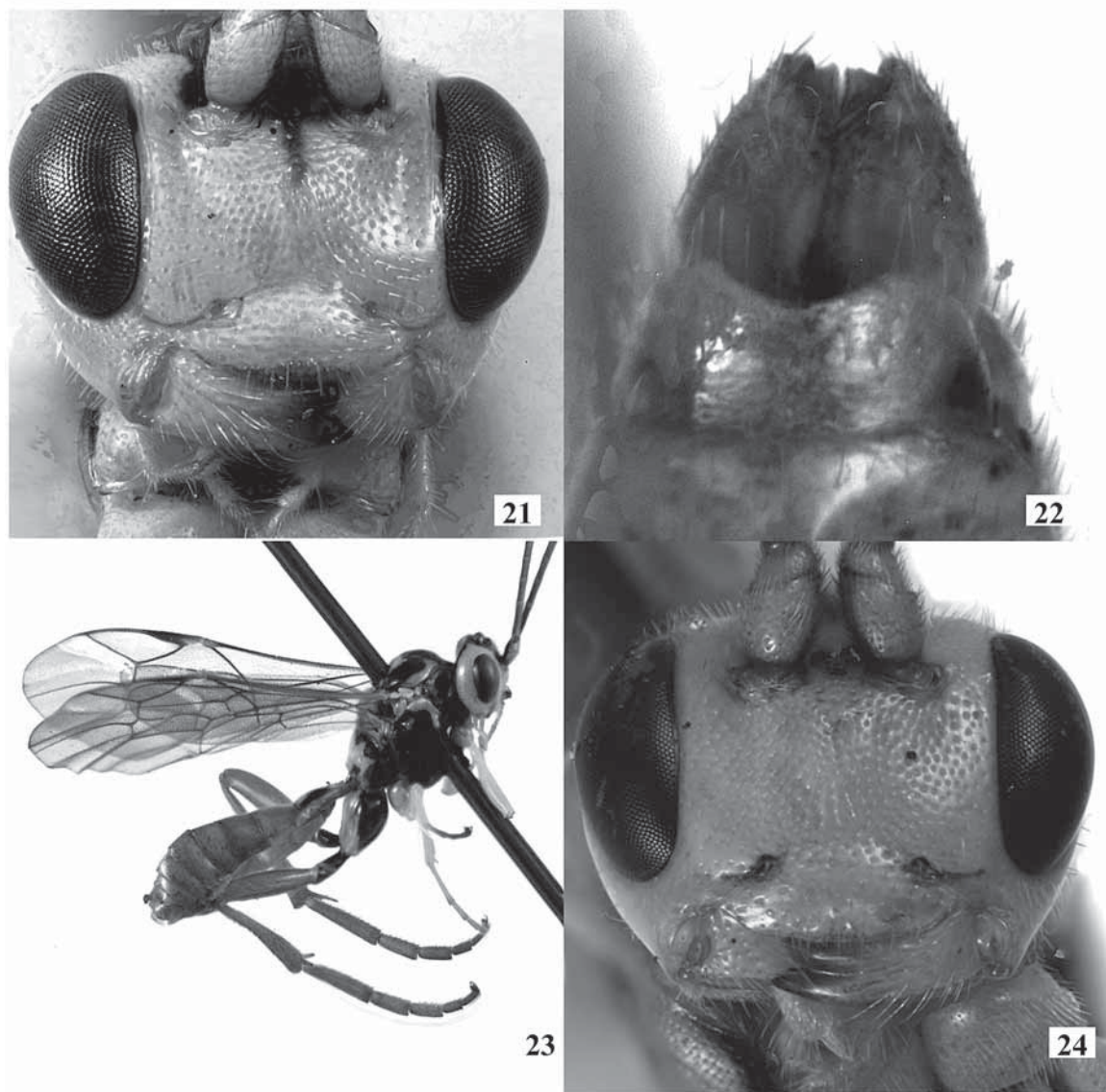
*Remarks*. This species is somewhat color variable, this being perhaps more obvious relative to other species due to the large number of specimens available. The metapleuron, for example, varies from nearly all yellow to all black, and the extent of yellow markings on the mesoscutum is also quite variable. In addition to variation in leg coloration noted in the description, a few specimens from Arizona (not included as paratypes) have the hind tarsi entirely pale. The color variation makes it a challenge to differentiate several similarly colored species from southwestern U. S.

The species name is Latin for concave, referring to the evenly concave margin of the male subgenital plate. This species is known only from southern Arizona and central Nuevo Leon, Mexico, but is likely to occur along the USA/Mexico border between these two areas.

### ***Physotarsus cordatus* Zhaurova, n. sp. (Figs 23–26)**

*Diagnosis*. Lateral ocelli separated by 1.3X their widest diameter from each other and about 2.2X their widest diameter from eye margin. Antennae with 36–38 flagellomeres. Pronotum glabrous medially around and

below lateral groove, punctate anterolaterally. Mesoscutum shiny, sparsely punctate on anterior 0.4. T1 about twice as long as broad. Head yellow with black median stripe on vertex and usually frons; occiput black. Mesosoma black and yellow dorsally (Figs 23, 26). T1 yellow basally with black spot laterally on each side between spiracle and posterior margin; metasoma otherwise uniformly orange. Hind femur, tibia, and tarsomeres uniformly orange. Fore wing entirely hyaline.



**FIGURES 21–24.** Habitus, face, and male genitalia. 21–22, *Physotarsus concavus* **n. sp.**; 21, face; 22, male genitalia, ventral view. 23–24, *P. cordatus* **n. sp.**; 23, habitus; 24, face.

*Physotarsus cordatus* is one of several species with a black and yellow mesosoma and a distinctly punctate mesopleuron. It differs from nearly all of these by the absence of dark brown to black markings on T2–6, which are uniformly orange in *P. cordatus*. *Physotarsus truncatus* is nearly identical but is darker, most notably on the mesoscutum which lacks the yellow notaular lines of *P. cordatus*.

**Description. Female:** Body (Fig. 23) 5.6 mm, fore wing 5.3 mm. Head (Fig. 24): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 2.8X as wide as long, divided medially by very shallow transverse depression. Face covered with very short setae; setae longer, slightly less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.4–0.5X width of mandibular base. Face twice as broad as long, slightly more protruding dorsally than ventrally in profile, sparsely punctate



laterally, more densely punctate medially. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.3X widest diameter of median ocellus. Lateral ocelli separated by 1.3X their widest diameter from each other and about 2.2X their widest diameter from the eye margin. Area between lateral ocelli slightly depressed; area immediately behind ocelli not sharply declivitous. Antennae with 36–38 flagellomeres, first flagellomere 1.3X widest transverse diameter of eye, second flagellomere 0.6X length of first. Occipital carina present on ventral 0.6–0.7 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally rounded, slightly upcurved. Lateral groove of pronotum distinctly impressed, usually weakly sculptured, extending over dorsal 0.6. Pronotum glabrous medially around and below lateral groove, punctate anterolaterally. Mesoscutum shiny, sparsely punctate on anterior 0.4 (Fig. 26). Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron quite densely punctate ventrally. Metapleuron evenly, densely setose. Propodeum without carinae; impunctate and glabrous medially, moderately to densely punctate and pubescent laterally. Tarsal claws simple. Fore wing stigma narrow, roughly 4.5X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.2X longer than wide; 2rs-m 1.8X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a interstitial to weakly postfurcal relative to Rs&M. Hind wing M+Cu bowed; basal abscissa of Rs approximately equal length of rs-m; 1st abscissa of Cu1 approximately equal cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored on nearly flat surface; spiracles not protruding; dorsolateral carina extending about half distance to spiracle. Cerci distinct, slightly ovate, weakly but distinctly protruding.

*Male*: First flagellomere 5.4–5.5X longer than wide. Subgenital plate with wide, deep, truncate median incision, its margin slightly bifurcate (Fig. 25). Aedeagal margin not toothed. Otherwise similar to female in structure and color, but more variable: 2rs-m 1.4–2.4X longer than abscissa of M between 2rs-m and 2m-cu; cu-a weakly antefurcal to weakly postfurcal relative to Rs&M.

*Color*. Head yellow with broad, black, median longitudinal band on vertex, usually continuing anteriorly to base of antenna, occasionally extending as narrow stripe to dorsal tubercle on face; occiput black. Antenna dark brown at base, gradually becoming orange medially, dark brown to black at apex, darker dorsally than ventrally, pale flagellomeres numerous, but number quite variable. Pronotum, mesopleuron, and metapleuron mostly black, scutellum and all but thin basal margin of propodeum yellow, mesoscutum with varying pattern of black and yellow (Fig. 26). T1 yellow basally with black spot laterally on each side extending from spiracle and posterior margin; metasoma otherwise uniformly orange; cerci usually dark. Hind coxa black and yellow, occasionally with orange, hind femur, tibia, and tarsomeres uniformly orange. Fore wing entirely hyaline.

*Material Examined*. Holotype ♂ (AEIC, Type No. 3850): [USA, Nebraska] first line of data label: “Valentine Refuge” second line: “VI.4. 72Nebraska” third line: “H. & M. Townes”. Paratypes: 1 ♀ 5 ♂ 2 sex unknown, same data as holotype except dates ranging 6–8.vi.1972 (AEIC, TAMU); 1 ♂ [USA], Texas, Fredricksburg, 5.v.1988 (H&M Townes) (AEIC).

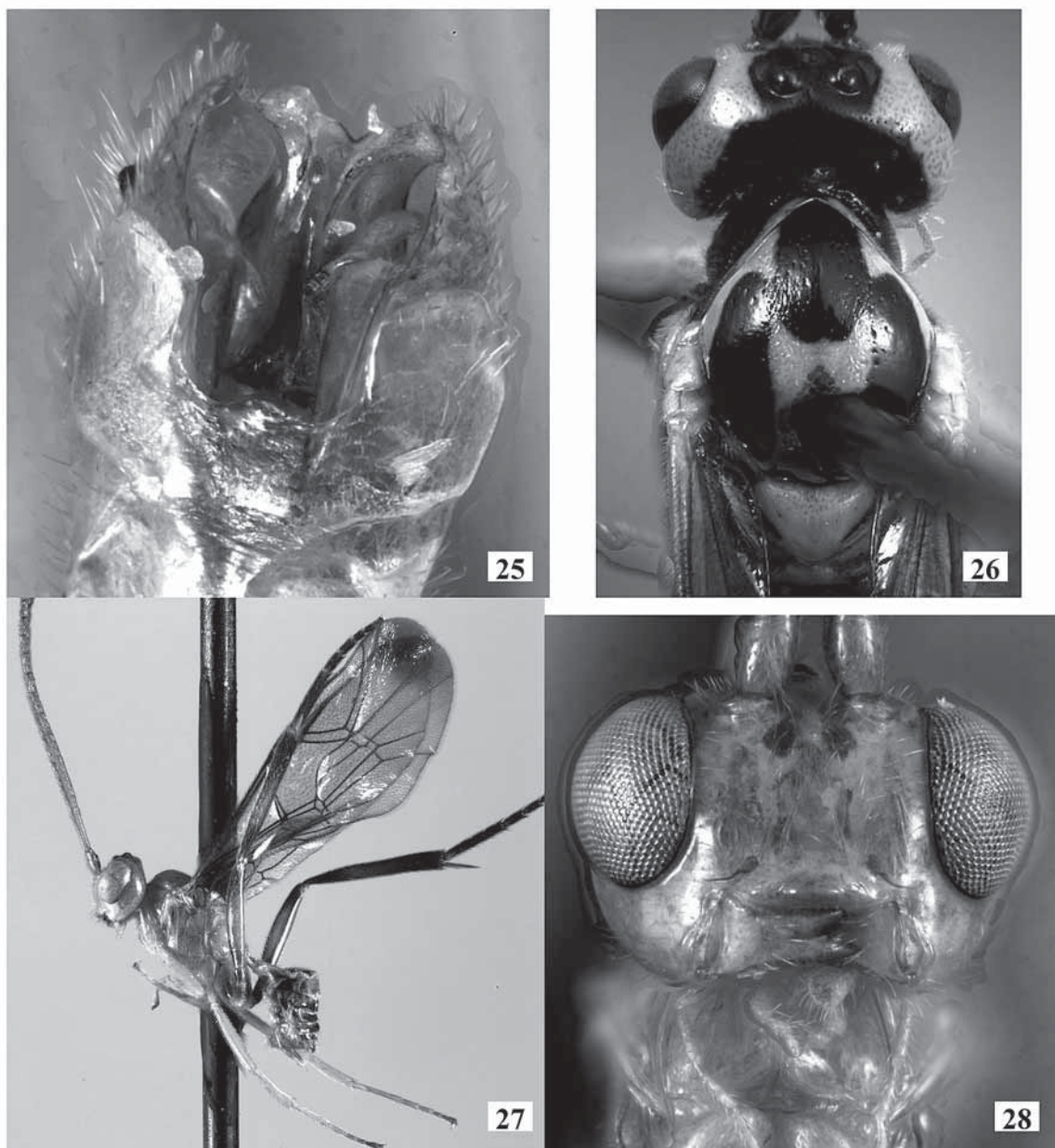
*Remarks*. The holotype is not as extensively dark as most of the paratypes, but was chosen because it is in better condition. In the holotype, for example, the black median band on the head is broadly interrupted on the frons, which is mostly yellow.

The species name is derived from Latin for heart, referring to the heart-shaped aedeagus and outline of the subgenital plate. This species is known only from central Texas and north-central Nebraska.

### ***Physotarsus eliethi* Gauld, 1997 (Figs 27, 28)**

*Physotarsus eliethi* Gauld, 1997: 198–199. Holotype ♀ in AEIC.

*Physotarsus eliethi*: Yu & Horstmann 1997: 455 (catalog).



**FIGURES 25–28.** *Physotarsus* spp. 25–26, *P. cordatus* n. sp.; 25, male genitalia, ventral view; 26, head and mesonotum, dorsal view. 27–28, *P. eliethi*; 27, habitus; 28, face.

*Diagnosis.* Lateral ocelli separated by 0.9–1.1X their widest diameter from each other and 1.6X their widest diameter from eye margin. Antenna with 24 flagellomeres. Pronotum completely glabrous. Mesoscutum shiny, impunctate. T1 about 2.3X as long as broad. Head dark yellowish, area around ocelli brownish. Mesosoma yellowish, metasomal terga 2–8 brownish. Hind tibia brown. Fore wing hyaline, apex brownish.

*Physotarsus eliethi* is readily distinguished from other smooth-bodied species with pale mesosomas by the exceptionally long, narrow first flagellomere (about 10X longer than wide).

*Description. Female:* Body (Fig. 27) 3.0 mm, fore wing 4.0 mm. Head (Fig. 28): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 3.3X as wide as long, not divided medially by transverse depression. Anterior tentorial pits elongate, pointed laterad. Malar space 0.7X width of mandibular base. Face 1.6X as broad as long, rounded in profile, impunctate. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance greater than distance between

lateral ocelli. Widest diameter of median ocellus slightly smaller than widest diameter of torulus. Lateral ocelli separated by 0.9–1.1X their widest diameter from each other and 1.6X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 24 flagellomeres, flagellomeres slender, first flagellomere about 10.0X longer than wide, 1.4X widest transverse diameter of eye, second flagellomere 0.7X length of first. Occipital carina present on ventral 0.5 of head. Mesosoma: Anterior margin of pronotum broadly truncate, laterally rounded and slightly upcurved. Lateral groove of pronotum weak, not extending ventrally past dorsal 0.3. Pronotum completely glabrous, impunctate. Mesoscutum shiny, impunctate. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron very sparsely punctate ventrally. Propodeum with posterior vestige of pleural carina present; impunctate. Tarsal claws with stout setae basally. Fore wing marginal cell about 2.7X longer than wide; Cu1a about 0.4X length of 2cu-a. Metasoma: T1 about 2.3X as long as broad. Cerci indistinct.

*Color.* Yellowish to light orange, brownish markings present around ocelli and on T2–8. Antennae darkening apically. Hind femur dark orange to light brownish, rest of leg dark brown. Fore wing hyaline, apex brownish.

*Male:* Unknown.

*Material Examined.* Holotype: ♀ (AEIC, Type No. 3572): COSTA RICA, Cartago Prov., Braulio Carrillo National Park, 400 m, ii.1985 (H Goulet).

*Remarks.* Gauld (1997) described this species from a single specimen, and suggested that the specimen was probably collected in Limón Province rather than Cartago Province.

### ***Physotarsus emarginatus* Zhaurova, n. sp. (Figs 29–31)**

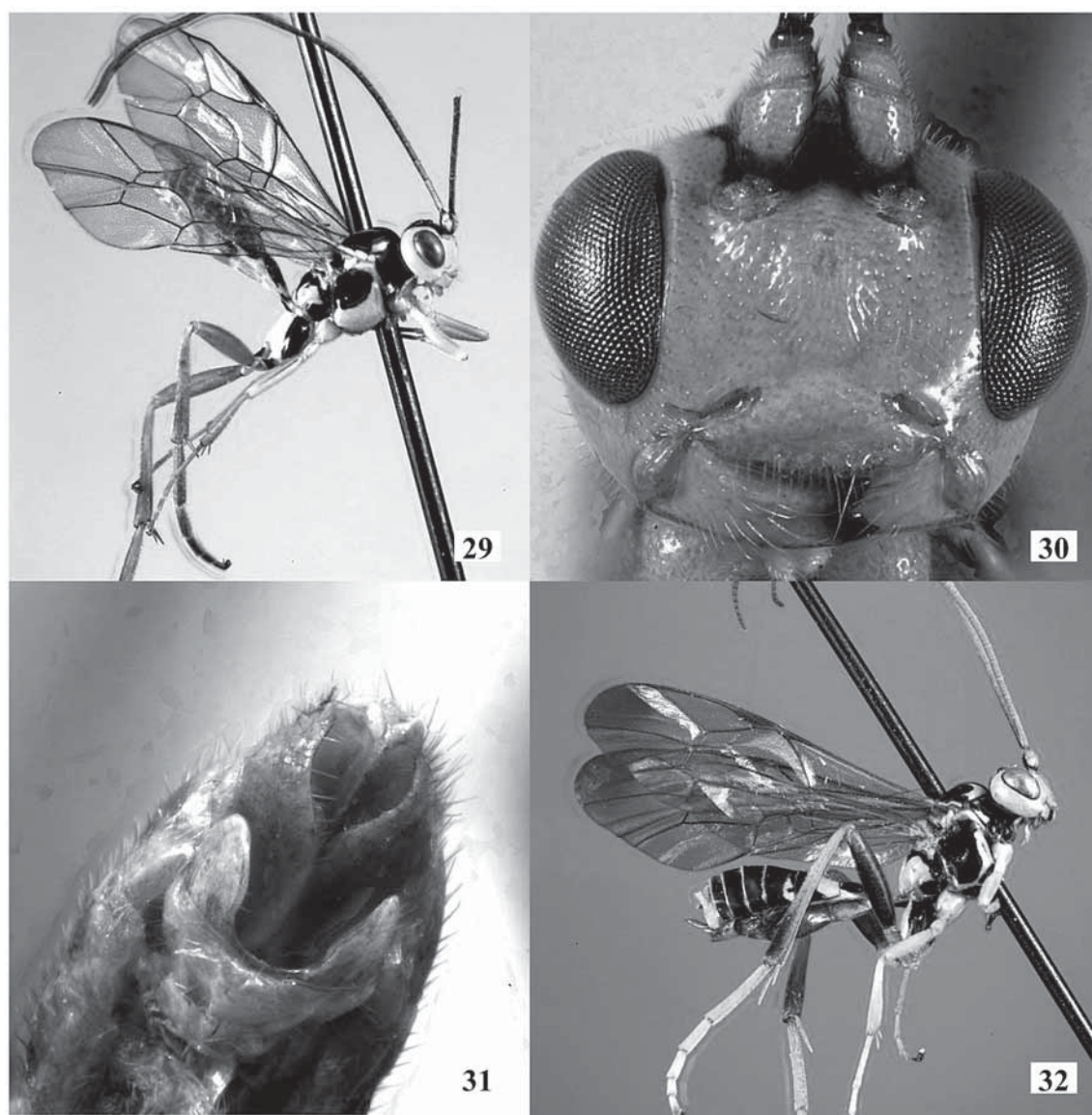
*Diagnosis.* Lateral ocelli separated by 1.0–1.2X their widest diameter from each other and 1.5–1.7X their widest diameter from eye margin. Antenna with 35–38 flagellomeres. Pronotum completely glabrous. Mesoscutum shiny, very sparsely punctate on anterior 0.3. T1 about twice as long as broad. Head yellow with black median stripe on frons and vertex; occiput black. Mesosoma black and yellow (Fig. 29). T1 yellow basally with two black bands extending from spiracle to apex; T2 and often T3 with yellow triangular patch medially, otherwise dark brown to black, remaining tergites largely dark laterally, variously yellow to orange medially. Hind femur and tibia orange, tarsomeres dark orange to brown, usually darker dorsally. Fore wing entirely hyaline.

*Physotarsus emarginatus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a sparsely to impunctate mesoscutum. It is nearly identical to *P. cordatus* and *P. truncatus*, but the mesoscutum and mesopleuron are more extensively black in *P. truncatus* and the metasomal tergites distad the petiole are more uniformly orange in *P. cordatus*. All three species have a deeply emarginate male subgenital plate.

*Description. Female:* Body (Fig. 29) 3.9–5.0 mm, fore wing 3.8–5.0 mm. Head (Fig. 30): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 2.6–2.8X as wide as long, divided medially by very shallow transverse depression. Face covered with very short setae; setae longer, slightly less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.5–0.6X width of mandibular base. Face 2.0–2.2X as broad as long, slightly to moderately protruding dorsally in profile, evenly sparsely punctate. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of median ocellus about equal widest diameter of torulus. Lateral ocelli separated by 1.0–1.2X their widest diameter from each other and 1.5–1.7X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 35–38 flagellomeres, first flagellomere 6.6–7.2X longer than wide, 1.2X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first.



Occipital carina present on ventral 0.6–0.7 of head. Mesosoma: Anterior margin of pronotum broadly truncate, laterally rounded and slightly upcurved. Lateral groove of pronotum well-developed, sculptured, extending over dorsal 0.7, rarely complete to posterior margin. Pronotum completely glabrous, impunctate. Mesoscutum shiny, very sparsely punctate on anterior 0.3. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron usually moderately but weakly punctate. Metapleuron evenly setose. Propodeum with at least posterior vestige of pleural carina present; impunctate medially, moderately punctate laterally. Tarsal claws with stout setae basally. Fore wing stigma roughly 4.0X longer than wide; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 3.1–3.2X longer than wide; 2rs-m 1.8–2.8X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.5X length of 2cu-a; cu-a interstitial to more rarely weakly antefurcal relative to Rs&M. Hind wing M+Cu moderately, not strongly bowed; basal abscissa of Rs 0.9–1.2X length of rs-m; 1st abscissa of Cu1 1.0–1.5X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; with shallow median groove basally fading to flat surface at level of spiracle, moderately convex posteriorly, dorsal tendon anchored within shallow depression; spiracles not strongly protruding; dorsolateral carina extending 0.4–0.5X distance to spiracle. Cerci not readily visible.



**FIGURES 29–32.** Habitus, face, and male genitalia. 29–31, *Physotarsus emarginatus* n. sp.; 29, habitus; 30, face; 31, male genitalia, ventral view. 32, *P. flaivpennis* n. sp., habitus.

*Male*: First flagellomere 7.2–7.8X longer than wide; fore wing with 2rs-m 2.4–3.8X longer than abscissa of M between 2rs-m and 2m-cu; hind wing with 1st abscissa of Cu1 1.6–1.9X longer than cu-a. Otherwise identical in structure and color to female except subgenital plate with wide deep truncate median incision, its margin even. Aedeagal margin not toothed (Fig. 31).

*Color*. Head yellow with black median stripe on frons and vertex, extending as narrow line to median tubercle on face in only one specimen; occiput black. Antenna dark brown to black dorsally, scape, pedicel and first flagellomere yellow ventrally with remaining flagellomeres gradually darkening to brown distally, often with faint subapical band of 1–3 flagellomeres. Pronotum, except for ventrolateral corner, mesoscutum except for pair of median and anterolateral marks, mesopleuron dorsally, and usually most of metapleuron black; dorsoposterior corner of mesopleuron nearly always black; mesopleuron ventrally black in about half of material examined; mesoscutellum yellow; propodeum mostly yellow with black horseshoe-shaped marking. T1 yellow basally with two black bands extending from spiracle to or nearly to apex, bands sometimes partially coalescing basomedially; T2 and often T3 with yellow triangular patch medially, otherwise dark brown to black, remaining tergites largely dark laterally, with varying amounts of yellow to orange medially. Hind coxa yellow with broad black band laterally, trochanter largely black, trochantellus mostly yellow, femur and tibia orange, usually with black markings at base of femur, tarsomeres dark orange to brown, usually darker dorsally. Fore wing entirely hyaline.

*Material Examined*. Holotype ♂ (AEIC, Type No. 3851): [USA, Arizona] first line of data label: “Portal, Ariz.” second line: “VIII.31.1974” third line: “H. & M. Townes”. Paratypes: 1 ♂ 4 ♀, same data as holotype except dates ranging 14.viii–3.ix.1974 (AEIC).

*Remarks*. The species name is from Latin, referring to the rounded excavation in the male subgenital plate. This species is known only from southeastern Arizona.

### ***Physotarsus flavipennis* Zhaurova, n. sp. (Figs 32, 33)**

*Diagnosis*. Lateral ocelli separated by about 1.0X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Antenna with 44–47 flagellomeres. Pronotum mostly glabrous, sparsely punctate along anterior margin. Mesoscutum shiny, very sparsely punctate on anterior 0.3. T1 about 1.7X as long as broad. Head yellow with a median black stripe on frons and vertex. Mesosoma yellow and black. Metasoma with T1–T6 yellow on basal half, black on apical half. Hind femur predominantly orange, proximal 0.6 of tibia yellow, rest dark orange to brown, tarsomeres yellow. Fore wing light yellow-brown, apex infumate.

The distinctly punctate mesopleuron in combination with the distinctive wing color readily separates this relatively large-bodied species from all other described *Physotarsus*. Both *P. adriani* and *P. castilloi* have similarly bicolored wings but much smoother bodies.

*Description*. *Female*: Body (Fig. 32) 8.6–9.1 mm, fore wing = 6.6–9.0 mm. Head (Fig. 33): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 3.8X as wide as long, divided medially by very shallow transverse depression. Face covered with short to very short setae; setae longer, slightly less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space about 0.5–0.7X width of mandibular base. Face 2.0–2.2X as broad as long, moderately protruding dorsally in profile, sparsely punctate laterally, punctures quite strong and dense medially, occasionally coalescing to appear slightly rugose. Interantennal area flat, area immediately behind antennae weakly concave turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.4–1.6X widest diameter of median ocellus. Lateral ocelli separated by about 1.0x their widest diameter from each other and about 2.0X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 44–47 flagellomeres, first flagellomere 5.7–7.0X longer than wide, 1.3–1.4X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first. Occipital

carina present on ventral 0.6–0.7 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum well-developed, crenulate to rugulose, extending over dorsal 0.7–0.8, sometimes complete to posterior margin. Pronotum mostly glabrous, impunctate medially, sparsely punctate anterolaterally. Mesoscutum shiny, very sparsely punctate on anterior 0.3. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron moderately punctate. Metapleuron evenly setose. Propodeum without carinae; impunctate medially, densely punctate laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, approximately 4.0X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.1–3.2X longer than wide; 2rs-m 1.9–2.9X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.7X length of 2cu-a; cu-a weakly to distinctly antefurcal relative to Rs&M, more rarely interstitial. Hind wing M+Cu weakly bowed; basal abscissa of Rs 1.3–1.5X longer than rs-m; 1st abscissa of Cu1 1.5–2.3X longer than cu-a. Metasoma: T1 about 1.7X as long as broad; surface in profile flat basally, convex posteriorly, dorsal tendon within very shallow basal groove, not delimited distally; spiracles not protruding in profile; dorsolateral carina extending 0.6–0.8X distance to spiracle. Cerci somewhat oval, not or only barely protruding, not prominent.

*Male:* Subgenital plate with wide, deep, truncate median incision, its margin even. Aedeagal margin not toothed. Structure and color otherwise about as in female, with fore wing measurements slightly more variable and hind wing cu-a often longer (Cu1a 1.3–1.4X longer than cu-a)

*Color.* Head yellow with a median black band on frons and vertex, often extending as narrow line to dorsal tubercle on face; occiput black. Antenna orange basally, yellow subapically, dark brown to black over apical 0.25, scape and pedicel usually black dorsally. Pronotum almost entirely and mesopleuron mostly black; mesoscutum and metapleuron with varying amounts of yellow and black, with yellow on mesoscutum usually confined to anterolateral margin, notaular lines and posteromedially; mesoscutellum yellow, propodeum yellow with narrow black margin anteriorly. Metasoma usually with T1–T6 yellow on basal half, black on apical half. Hind leg with coxa yellow and black, femur predominantly orange, proximal 0.6 of tibia yellow, remainder dark orange to brown, tarsomeres yellow. Fore wing light yellow-brown, apex infumate.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3852): [USA, Texas] first line of data label: “Fredericksburg” second line: “V.11.1988 Tex.” third line: “H. & M. Townes”. Paratypes: 14 ♀ 9 ♂, same data as holotype except dates ranging 30.iv–17.v.1988 (AEIC, TAMU); 1 ♂, Texas, Kerrville, 12.v.1988 (H&M Townes) (AEIC).

*Remarks.* This species forms a group with several others noted above, defined by the deep, truncate emargination of the male subgenital plate. *Physotarsus flavipennis* is much different in appearance because of its larger body size and distinctive wing color. It is known only from central Texas.

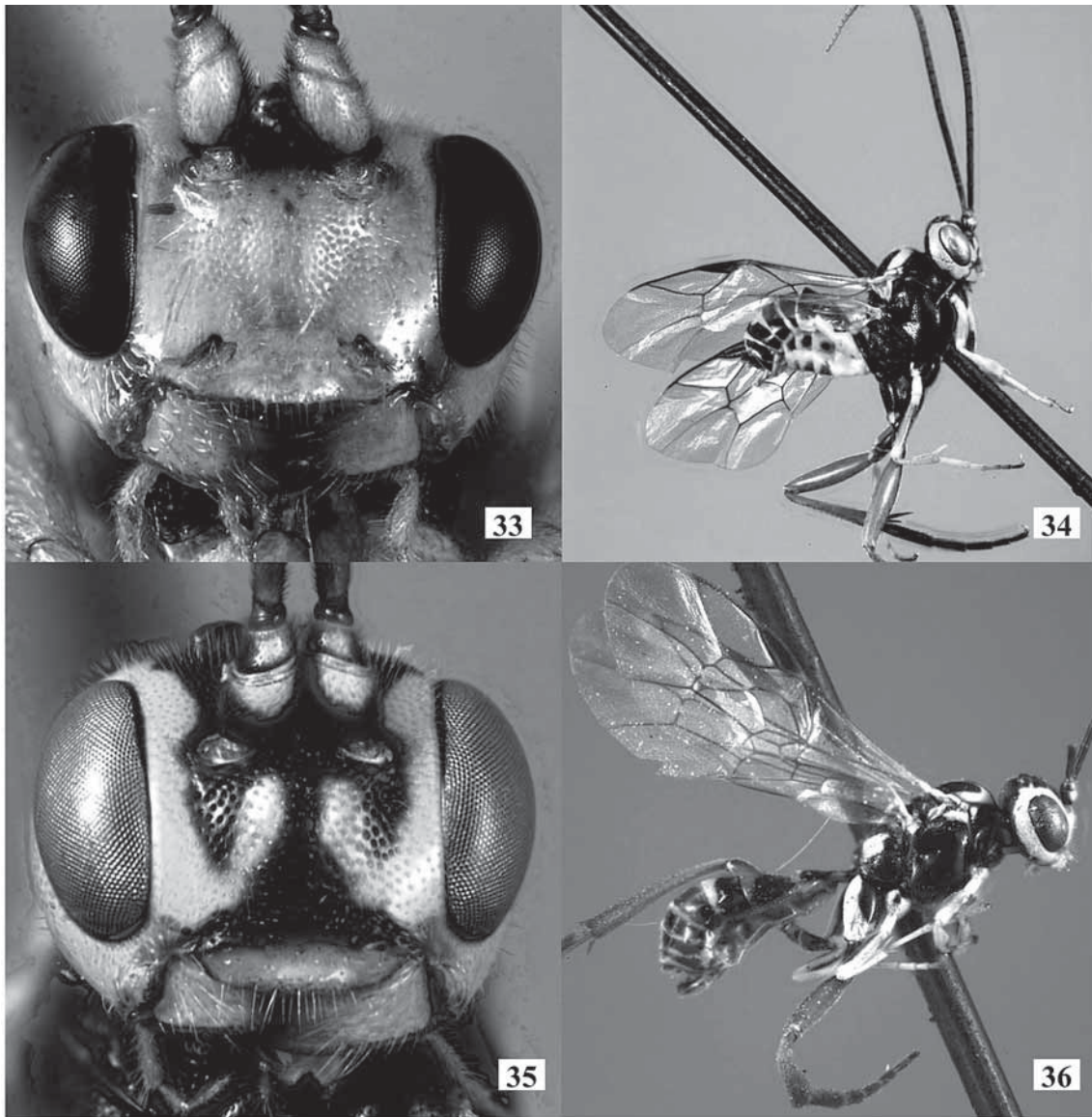
The species name is derived from Latin for yellow and wing, referring to the yellow wings.

### ***Physotarsus foveatus* Zhaurova, n. sp. (Figs 34, 35)**

*Diagnosis.* Lateral ocelli separated by about 1.8X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Antenna with 29–33 flagellomeres. Pronotum sparsely punctate on anterior and posterior margins, densely punctate to rugose medially. Mesoscutum densely punctate over its entire surface. T1 about twice as long as broad. Head yellow with wide, black, median stripe usually originating at upper half of clypeus and extending to occiput; occiput black. Mesosoma almost entirely black with some yellow on mesoscutum. Metasomal tergites largely black with yellow apical trim; cerci dark. Hind femur orange, tibia and tarsomeres black. Fore wing entirely hyaline.

*Physotarsus foveatus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a completely hyaline wing. It differs from all but *P. melotarsus* and *P. tonicus* in having the entire mesoscutum deeply punctate. The face is completely yellow in *P. melotarsus* and partially to completely black medially in *P. foveatus* and *P. tonicus*. The fore and mid femora are extensively dark brown to black in *P. tonicus* and yellow to orange in *P. foveatus*.





**FIGURES 33–36.** Habitus and face. 33, *Physotarsus flavipennis* n. sp., face. 34–35, *P. foveatus* n. sp.; 34, habitus; 35, face. 36, *P. gineus* n. sp., habitus.

*Description. Female:* Body (Fig. 34) 4.4–5.9 mm, fore wing 4.5–5.0 mm. Head (Fig. 35): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 3.2X as wide as long, not separated medially by transverse depression. Face covered with very short setae; setae only slightly longer, less dense on clypeus. Anterior tentorial pits elongate, pointed laterally. Malar space small, about 0.3–0.4X width of mandibular base. Face 1.9X as broad as long, protruding dorsally in profile, evenly, densely punctate. Interantennal area flat, area immediately behind antennae weakly concave turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance about equal to distance between lateral ocelli. Widest diameter of torulus 1.2X widest diameter of median ocellus. Lateral ocelli separated by about 1.8X their widest diameter from each other and about 2.0x their widest diameter from eye margin. Area between lateral ocelli strongly depressed medially, area immediately behind ocelli not sharply declivitous. Antenna with 29–33 flagellomeres, first flagellomere 4.3–5.0X longer than wide, 0.9X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first. Occipital carina present on ventral 0.7–0.8 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum vestigial, sculptured, present on dorsal 0.3. Pronotum sparsely

punctate on anterior and posterior margins, densely punctate to rugose medially. Mesoscutum densely punctate over its entire surface. Epinemial carina parallels anterior margin of mesopleuron. Mesopleuron densely and deeply punctate with a very small impunctate area. Metapleuron densely short setose. Propodeum with pleural carina complete; propodeum somewhat rugose and impunctate medially, densely punctate laterally. Tarsal claws simple. Fore wing stigma 3.4–3.7X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.0X longer than wide; 2rs-m variable, 1.8–3.4X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.8X length of 2cu-a; cu-a weakly antefurcal relative to Rs&M. Hind wing M+Cu bowed; basal abscissa of Rs 1.1–1.2X longer than rs-m; 1st abscissa of Cu1 1.9–4.0X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile flat near level of spiracles, weakly convex posteriorly, dorsal tendon anchored within distinct basal median groove, groove elongate but gradually decreasing in depth and not delimited distally; spiracles not or only weakly protruding in profile; dorsolateral carina low but usually distinct, usually extending 0.7–0.9X distance to spiracle. Cerci distinct because of contrasting coloration, round to slightly ovate, nearly flat.

*Color.* Head yellow with wide, black, median stripe usually originating at upper half of clypeus and extending to occiput, lower face occasionally with almost no black markings and middle of face often with pair of yellow spots within black stripe; occiput black. Antennae dark brown to black basally, gradually becoming lighter towards apex with apical 0.2–0.3 orange. Mesosoma almost entirely black with mesoscutellum yellow and mesoscutum with some yellow along anterolateral margin extending posteriorly along notaular lines. Metasomal tergites largely black with yellow apical trim; cerci dark. All coxae black; fore and mid trochanter, trochantellus, tibia, and tarsomeres yellow, femur variously yellow and orange, occasionally with mid femur dark brown; hind trochanter dark brown to black, trochantellus often a little less dark, femur orange, tibia and tarsomeres black. Fore wing entirely hyaline.

*Male:* Unknown.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3853): [USA, Arizona] first line of data label: “Portal, Arizona” second line: “Sept. 18, 1987” third line: “H. & M. Townes”. Paratypes: 10 ♀, same data as holotype except dates ranging 14.viii–3.ix.1974 & 13.ix.1987 (AEIC, TAMU); 1 ♀ MEXICO, Nuevo Leon, 5mi. S. Monterrey, 3.ix.1958 (HF Howden) (CNC).

*Remarks.* The species name is derived primarily from the Latin word for pit and refers to the distinctive anterior tentorial pits. This species is known only from southeastern Arizona and central Nuevo Leon and its known distribution is thus almost identical to that of *P. concavus*.

### ***Physotarsus gineus* Zhaurova, n. sp. (Figs 36, 37)**

*Diagnosis.* Lateral ocelli separated by about 1.8X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Antenna with 28–29 flagellomeres. Pronotum largely glabrous, sometimes sparsely punctate or slightly rugose medially. Mesoscutum shiny, very sparsely punctate on anterior 0.3. T1 about 2.3X as long as broad. Head pale yellow with black median stripe on frons and vertex; occiput black. Mesosoma largely black with yellow markings on mesoscutum, mesoscutellum and propodeum. Metasomal segments largely black with thin yellow apical trim. Hind femur and tibia orange, tarsomeres dark brown. Fore wing hyaline, apex weakly infumate.

*Physotarsus gineus* is distinguished from all other black and yellow species with a distinctly punctate mesopleuron by the weakly infumate spot on an otherwise hyaline wing. It is otherwise similar in color pattern to species with a more densely and extensively punctate mesoscutum, especially *P. melotarsus*.

*Description. Female:* Body (Fig. 36): 3.5–4.1 mm, fore wing 3.6–4.0 mm. Head (Fig. 37): Clypeal margin thick, evenly rounded laterally, with thick, rounded central lobe. Clypeus about 2.9X as wide as long, not divided medially by transverse depression. Face covered with very short setae; setae longer, less dense on clypeus. Anterior tentorial pits extremely elongate and pointed laterally. Malar space small, about 0.3X width of mandibular base. Face 2.2–2.3X as broad as long, strongly protruding in profile, evenly sparsely punctate.

Interantennal area flat, area immediately behind antennae weakly concave turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance smaller than the distance between lateral ocelli. Widest diameter of torulus 1.4–1.6X widest diameter of median ocellus. Lateral ocelli separated by about 1.8X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 28–29 flagellomeres, first flagellomere 3.8–4.6X longer than wide, 0.8X widest transverse diameter of eye, second flagellomere 0.6–0.7X length of first. Occipital carina present on ventral 0.6–0.7 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum weak, weakly sculptured, present on dorsal 0.4. Anterior margin of the pronotum straight and slightly upcurved laterally. Pronotum largely glabrous, sometimes sparsely punctate or slightly rugose medially. Mesoscutum shiny, sparsely to very sparsely and weakly punctate on anterior 0.3. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron moderately to densely punctate ventrally. Metapleuron uniformly densely setose. Propodeum without carinae; impunctate to very lightly punctate medially, densely punctate laterally. Tarsal claws simple. Fore wing stigma about 3.5X longer than wide; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 2.8–2.9X longer than wide; 2rs-m 1.2–1.6X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.8X length of 2cu-a; cu-a weakly antefurcal relative to Rs&M. Hind wing M+Cu bowed to somewhat strongly bowed; basal abscissa of Rs 0.9–1.2X length of rs-m; 1st abscissa of Cu1 1.6–2.6X longer than cu-a. Metasoma: T1 about 2.3X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored to nearly flat surface; spiracles not or only weakly protruding in profile; dorsolateral carina extending more than half distance to spiracle, rarely to level of spiracle. Cerci distinct, round to slightly ovate, weakly to distinctly protruding.

*Male:* Subgenital plate with apical margin weakly and evenly concave. Aedeagal margin not toothed. Structure and color otherwise as in female except ratio for fore wing 2rs-m more variable and 1st abscissa of hind wing Cu1 1.2–2.2X longer than cu-a.

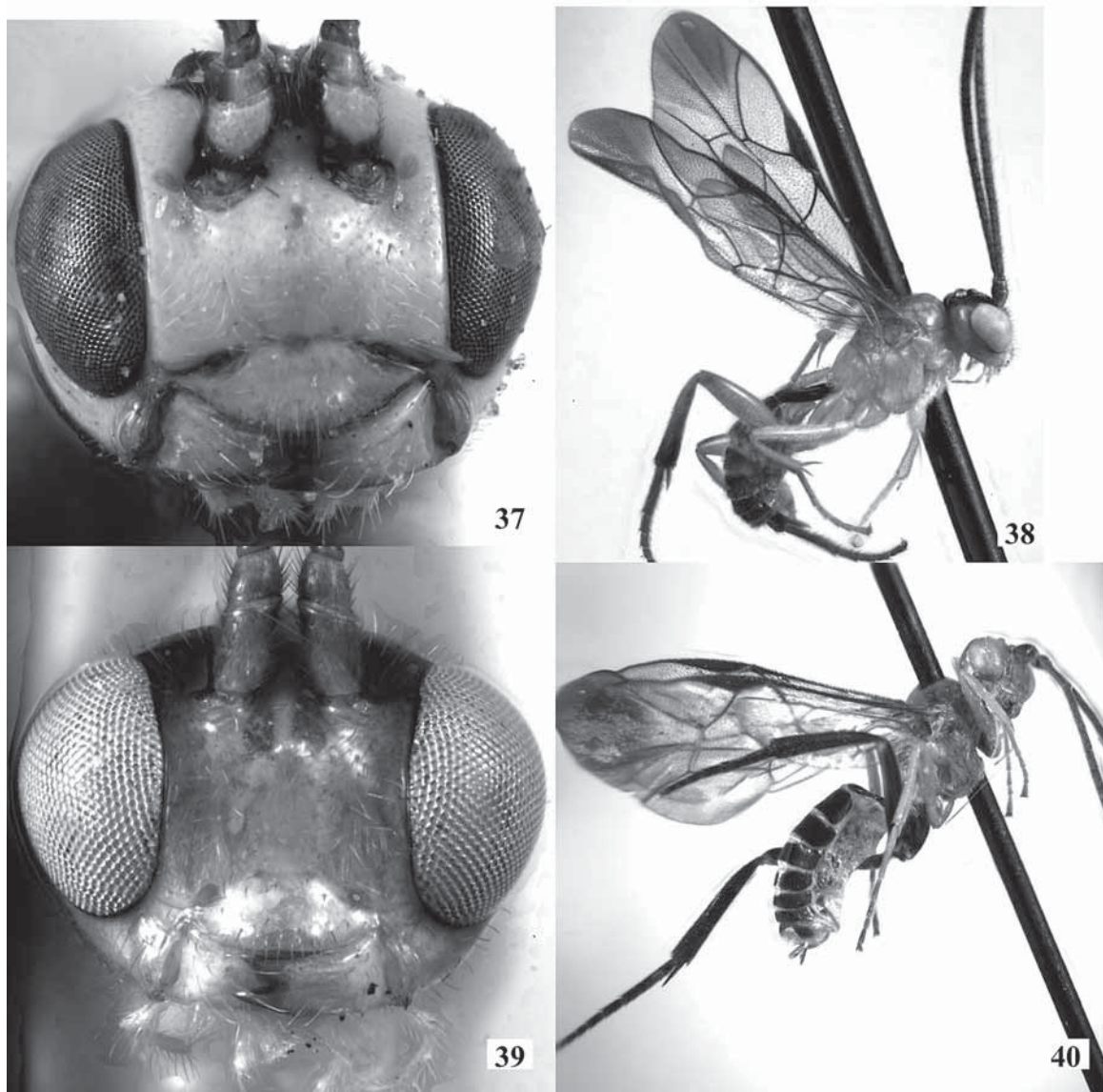
*Color.* Head pale yellow with black median stripe on frons and vertex; occiput black. Scape and pedicel pale yellow ventrally, antenna otherwise dark brown to black. Mesosoma largely black except mesoscutum pale yellow along anterolateral margin extending posteriorly along notaular lines, mesoscutellum pale yellow with large black spot basal-medially, propodeum pale yellow laterally to a varying extent. Metasomal segments largely black with thin apical yellow trim; cerci dark. Fore and mid legs largely pale yellow, femora darker, especially posteriorly. Hind coxa largely black, pale yellow dorsally, trochanter and trochantellus dark brown to black, hind femur and tibia orange, tarsomeres brown. Fore wing hyaline, apex weakly infumate.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3854): [USA, Arizona] first line of data label: “nr Roosevelt L” second line: “IV.27 47 Ariz” third line: “H & M Townes”. Paratypes: 2 ♀ 1 ♂, same data as holotype except dates ranging 21–29.iv.1947 (AEIC); Arizona, 1 ♂ Ajo, 9.iv.1947 (H&M Townes) (AEIC), 2 ♂ Maricopa Mountains, 10–13.iv.1947 (H&M Townes) (AEIC), 1 ♂ Sabino Canyon, 16.iv.1947 (H&M Townes) (AEIC); 1 ♂ USA, Texas, Gaines Co., 22 mi. W. Seminole, 25.iv.1971 (CR Ward) (TAMU). Additional material (not paratype): 1? (metasoma missing) USA, Nevada, Overton, 12.v.1930, *Prosopsis glandulosa* (honey mesquite) (EW Davis) (USNM).

*Remarks.* The epistomal sulcus is distinct in this species. The specimen from Nevada is more similar in color to *P. melotarsus*, and has a more heavily punctate mesopleuron than other specimens of *P. gineus*, but lacks the densely punctate mesoscutum of *P. melotarsus*. The specimens from Nevada and Texas were collected from mesquite. This species is known from the border of Texas and southern New Mexico, across Arizona to the southern corner of Nevada. This is *Physotarsus* species 1 in the analyses conducted by Zhaurova and Wharton (2009).

The species name is an arbitrary combination of letters.





FIGURES 37–40. Habitus and face. 37, *Physotarsus gineus* n. sp., face. 38–39, *P. glabellus* n. sp.; 38, habitus; 39, face. 40, *P. leucohypopygus*, n. sp., habitus.

***Physotarsus glabellus* Zhaurova, n. sp. (Figs 38, 39)**

**Diagnosis.** Lateral ocelli separated by 0.4X their widest diameter from each other and about 1.8X their widest diameter from eye margin. Antenna with 22–23 flagellomeres. Pronotum and mesoscutum shiny, impunctate. T1 about 1.5X as long as broad. Clypeus light yellowish to white, face yellow to pale orange, frons varying from mostly pale orange to entirely brown; occiput orange. Mesosoma pale orange above, fading to nearly white ventrally. Metasoma with T1 entirely brown, remaining tergites mostly brown with yellow apical margin. Fore and mid legs yellow. Most of hind femur and tibia yellow, with extreme apices brownish; tarsomeres dark brown to black. Fore wing hyaline, apex dusky.

*Physotarsus glabellus* is similar to several other smooth-bodied species that have hyaline wings with an infumate apical spot, most notably *P. eliethi*, *P. jamesi*, *P. leucohypopygus*, *P. niveus*, and *P. oculatus*. As in *P. jamesi* and to some extent *P. eliethi* the hind femur is entirely or almost entirely dark yellow to orange in *P. glabellus*. T1 is dark brown in *P. glabellus* but orange or mostly orange in *P. jamesi* and *P. eliethi* has the first

flagellomere about 10X longer than wide.

*Description. Female:* Body (Fig. 38) 3.7–4.0 mm, fore wing 3.7 mm. Head (Fig. 39): Clypeal margin widely rounded laterally, with thick, weakly angulate central lobe. Clypeus about 2.7X as wide as long, divided medially by shallow transverse depression. Face covered with short setae; setae longer, slightly less dense on clypeus. Anterior tentorial pits oval. Malar space 0.5–0.6X width of mandibular base. Face about 1.5X as broad as long, very weakly convex in profile, nearly flat, smooth. Interantennal area flat, area immediately behind antenna weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than the distance between lateral ocelli. Widest diameter of torulus about 1.2X widest diameter of median ocellus. Lateral ocelli separated by 0.4X their widest diameter from each other and about 1.8X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli sharply declivitous. Antenna with 22–23 flagellomeres, first flagellomere 3.9–4.3X longer than wide, about equal widest transverse diameter of eye, second flagellomere about 0.7X length of first. Occipital carina present on ventral 0.4 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally truncate, upcurved. Lateral groove of pronotum unsculptured, indistinct over dorsal 0.3. Pronotum and mesoscutum glabrous, shiny, impunctate. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent on ventral half. Metapleuron moderately but not uniformly setose. Propodeum with posterior vestiges of median longitudinal carina, pleural carina absent; impunctate medially, sparsely pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma about 4.0X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 2.8X longer than wide; 2rs-m usually 1.2–1.4X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a interstitial relative to Rs&M. Hind wing M+Cu very strongly bowed; basal abscissa of Rs equal in length to rs-m; 1st abscissa of Cu1 1.7–1.8X longer than cu-a. Metasoma: T1 about 1.5X as long as broad; surface in profile almost completely flat, dorsal tendon anchored within small, shallow, relatively discrete depression, spiracles protruding in profile; dorsolateral carina approximately half distance to spiracle. Cerci distinct, weakly protruding.

*Color.* Head with clypeus light yellowish to white, face yellow to pale orange, frons varying from mostly pale orange to entirely brown; occiput orange. Antenna brown, slightly lighter basally. Mesosoma pale orange above, fading to nearly white ventrally. Metasoma with T1 entirely brown, rest of tergites mostly brown with yellow apical trim; sternites brownish-yellow. Fore and mid legs white basally, yellow distally. Hind coxa, trochanter, trochantellus, most of hind femur and tibia yellow, apices of femur and tibia brownish, tarsomeres dark brown to black. Cerci light brown. Fore wing hyaline, apex dusky.

*Male:* Unknown.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3855): [BRAZIL, Pernambuco] first line of data label: “Caruaru, Brazil” second line: “Apr. 1972 900 m.” third line: “M Alvarenga”. Paratype: 1 ♀, same data as holotype.

*Remarks.* The epicnemial carina is difficult to see in the available specimens of *P. glabellus*. This species was therefore run to two different places in the key.

The species name is derived from Latin and refers to the small body with greatly reduced setae. This species is known only from east-central Brazil.

### ***Physotarsus jamesi* Zhaurova, n. sp. (Figs 63, 64)**

*Diagnosis.* Lateral ocelli separated by 0.5–0.7X their widest diameter from each other and 1.6X their widest diameter from eye margin. Antenna with 19–23 flagellomeres. Pronotum completely glabrous, mesoscutum shiny, impunctate. T1 about 1.2X as long as broad. Head dark yellow to orange, area around ocelli brownish. Mesosoma nearly orange dorsally, yellow laterally. Females with T1 and usually T2 orange, remaining terga mostly dark brown, males usually more extensively dark brown. Hind femur and tibia basally dark yellow to orange, tibia apically and tarsomeres dark brown to black. Fore wing hyaline, apex distinctly infumate.

*Physotarsus jamesi* is similar to several other smooth-bodied species that have hyaline wings with an infumate apical spot, most notably *P. eliethi*, *P. glabellus*, *P. leucohypopygus*, *P. niveus*, and *P. oculatus*. As in *P. glabellus* and to some extent *P. eliethi* the hind femur is entirely or almost entirely dark yellow to orange in *P. jamesi*. T1 is dark brown in *P. glabellus* but orange or mostly orange in *P. jamesi*. *P. eliethi* has the first flagellomere about 10X longer than wide, but it is much shorter in *P. jamesi*.

**Description.** *Female*: body (Fig. 63) 3.8–4.1 mm, fore wing 3.5 mm. Head (Fig. 64): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 3.1X as wide as long, not divided medially by transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate, pointed laterally. Malar space 0.7x width of mandibular base. Face 1.7x as broad as long, weakly convex in profile, impunctate. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of median ocellus slightly smaller than widest diameter of torulus. Lateral ocelli separated by 0.5–0.7x their widest diameter from each other and 1.6X their widest diameter from the eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 19–23 flagellomeres; first flagellomere 4.3–4.9X longer than wide, 1.4X widest transverse diameter of eye, second flagellomere 0.7X length of first. Occipital carina present on ventral 0.5 of head. Mesosoma: Anterior margin of pronotum broadly truncate, laterally rounded and slightly upcurved. Lateral groove of pronotum weak, not extending ventrally past dorsal 0.3. Pronotum completely glabrous, impunctate. Mesoscutum shiny, impunctate. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron with very sparsely punctate ventrally. Metapleuron sparsely setose. Propodeum with vestige of pleural carina posteriorly; impunctate. Tarsal claws with stout setae basally. Fore wing stigma about 3.4–3.8X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 2.7X longer than wide; 2rs-m 1.3–1.8X longer than abscissa of M between 2rs-m and 2m-cu, the latter quite variable; Cu1a about 0.4X length of 2cu-a; cu-a interstitial, rarely very weakly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 0.8–0.9X length of rs-m; 1st abscissa of Cu1 1.8–2.6X longer than cu-a. Metasoma: T1 about 1.2X as long as broad; surface in profile flat basally, very weakly convex, nearly flat posteriorly, dorsal tendon anchored within small, discrete basal depression; spiracles weakly protruding in profile; dorsolateral carina extending about 0.6x distance to spiracle, extending distally above spiracle as low, rounded edge. Cerci oval to nearly round, not distinctly protruding.

*Male*: Similar to female in structure except ratios for wing veins more variable; most available specimens slightly smaller. See color description below.

**Color.** Head dark yellow to orange, area around ocelli brownish. Mesosoma nearly orange dorsally, yellow laterally. Females with T1 and usually T2 orange, remaining terga mostly dark brown, males usually more extensively dark brown, with T1 also sometimes brown. Hind femur dark yellow to orange, tibia orange at least over basal half, dark brown to black apically, the pale coloration more extensive on anterior face, tarsomeres dark brown to black. Fore wing hyaline, apex distinctly infumate, nearly fuscous.

**Material Examined.** Holotype ♀ (TAMU): [DOMINICA] first line of data label: “Dominica: St. Paul Parish” second line: “ATREC, Springfield Station” third line: “15 20’25”N 61 21’50”W” fourth line: “21.v-5.vi.2000 Chavez,” fifth line: “Benavides, Dye, & Kretsch”. Paratypes: 2 ♀ 1 ♂, same data as holotype (AEIC, Forestry Division of Dominica, TAMU); 1 ♀, same locality, 31.v-14.vi.2002 (TAMU class) (TAMU), 7 ♂, same locality except 15 21’N 61 22’W, 24.v-4.vi.2003, voucher specimen #645 Texas A&M University (T Decker & W Wells) (AEIC, BMNH, Forestry Division of Dominica, TAMU).

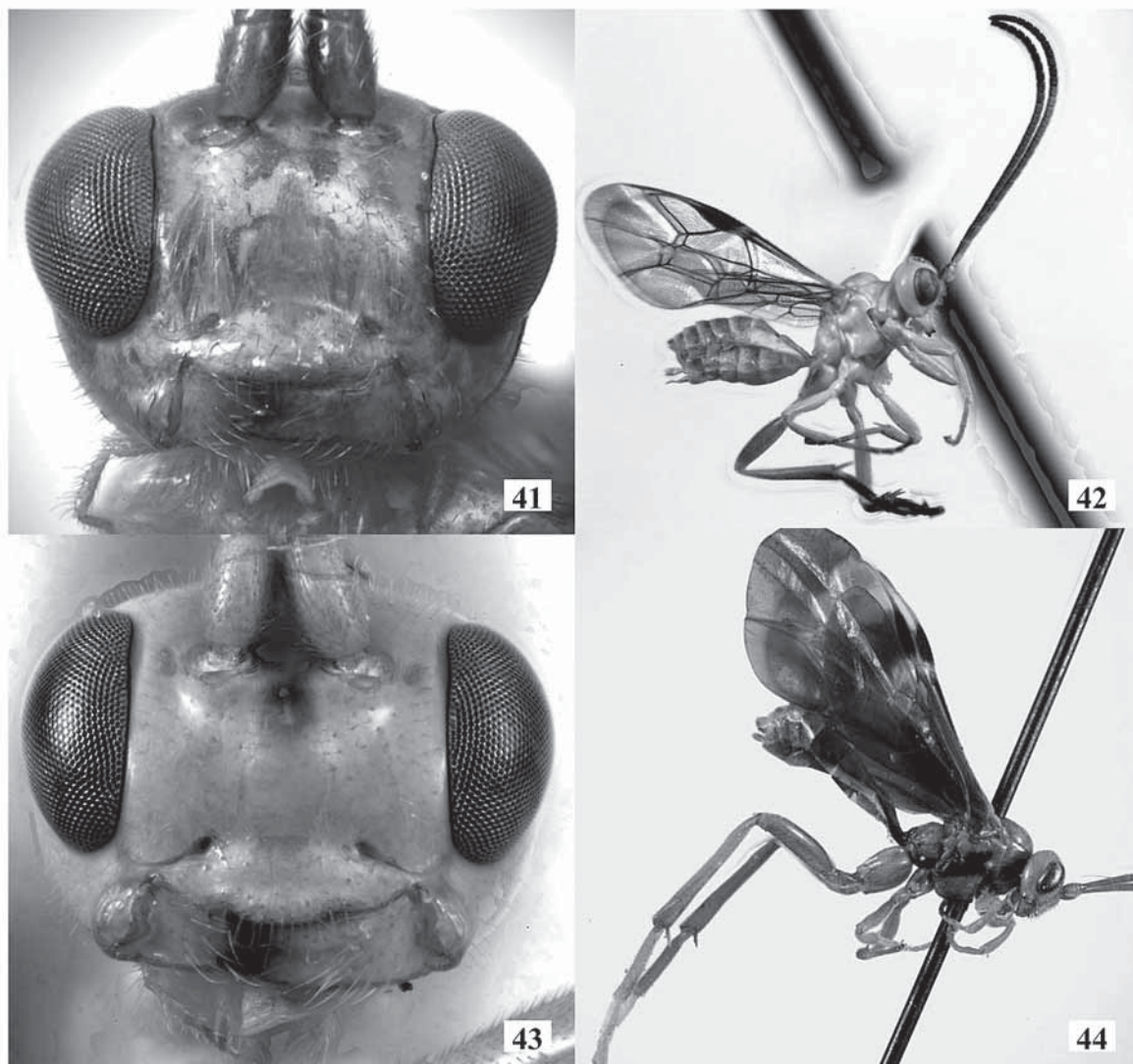
**Remarks.** The coloration is very similar to that of *P. eliethi*, with the infumate apical spot on the fore wing slightly larger in *P. eliethi*.

This species is named for Arlington James, for his many contributions to our understanding of the fauna of Dominica in the Lesser Antilles. It is only known from the island of Dominica.



*Physotarsus leucohypopygus* Zhaurova, n. sp. (Figs 40, 41)

**Diagnosis.** Lateral ocelli separated by 0.9–1.0X their widest diameter from each other and about 1.7X their widest diameter from eye margin. Antenna with 24 flagellomeres. Pronotum and mesoscutum shiny, impunctate. T1 about 2.2X as long as broad. Head and mesosoma entirely dark yellow. Metasomal tergites brown with thin white apical trim. Hind leg dark brown. Fore wing hyaline, apex fuscous.



**FIGURES 41–44.** Habitus and face. 41, *Physotarsus leucohypopygus*, n. sp., face. 42–43, *P. luteus* n. sp.; 42, habitus; 43, face. 44, *P. maculipennis*, habitus.

*Physotarsus leucohypopygus* is similar to several other smooth-bodied species that have hyaline wings with an infumate apical spot, most notably *P. eliethi*, *P. glabellus*, *P. jamesi*, *P. niveus*, and *P. oculatus*. As in *P. niveus* and *P. oculatus* the hind femur on the outer or anterior face is entirely or almost entirely dark brown to black in *P. leucohypopygus*. The ocellar field is dark brown in *P. oculatus* but the head above is completely orange in *P. leucohypopygus* and *P. niveus*. The propodeum is entirely orange in *P. leucohypopygus* but dark brown anteriorly and white posteriorly in *P. niveus*.

**Description.** *Female:* Body (Fig. 40) 4.4–4.6 mm, fore wing 4.6–4.8 mm. *Head* (Fig. 41): Clypeal margin widely rounded laterally, with thick, somewhat angulate central lobe. Clypeus about 2.6X as wide as long, not divided medially by transverse depression. Face sparsely covered with short setae; setae slightly longer, less dense on clypeus. Anterior tentorial pits oval. Malar space 0.5–0.6X width of mandibular base.

Face about 1.5X as broad as long, very weakly convex in profile, nearly flat, smooth. Interantennal area slightly concave, area immediately behind antenna weakly concave, turning convex laterally before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than the distance between lateral ocelli. Widest diameter of torulus about 1.2X widest diameter of median ocellus. Lateral ocelli separated by 0.9–1.0X their widest diameter from each other and about 1.7X their widest diameter from eye margin. Area between lateral ocelli flat to slightly depressed, area behind ocelli sharply declivitous. Antenna with 24 flagellomeres, first flagellomere 6.1–6.6X longer than wide, about equal widest diameter of eye, second flagellomere about 0.7X length of first. Occipital carina present on ventral 0.4 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally truncate, upcurved. Lateral groove of pronotum present, weakly sculptured on dorsal 0.3. Pronotum and mesoscutum shiny, impunctate. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent on the ventral half. Metapleuron sparsely setose. Propodeum with complete pleural carinae; impunctate medially, sparsely pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, about 4.2–4.5X longer than wide; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 2.6X longer than wide; 2rs-m 1.3–1.4X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a weakly but distinctly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.2–1.4X longer than rs-m; 1st abscissa of Cu1 1.6–2.1X longer than cu-a. Metasoma: T1 about 2.2X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored within small, relatively discrete depression; spiracles protruding in profile; dorsolateral carina extending about half distance to spiracle. Cerci distinct, round to slightly ovate, weakly protruding. Female subgenital plate widely rounded, larger than usual.

*Color.* Head and mesosoma entirely dark yellow. Antennae brown, except yellow-brown ventrally at base. Metasomal tergites brown with narrow white trim, sternites white. Subgenital plate white with narrow brown apical margin. Cerci light brown. Fore and mid legs dark yellow except tarsomeres of mid leg brownish. Hind leg entirely dark brown to black. Fore wing hyaline, apex fuscous.

*Male:* Unknown.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3856): [BRAZIL, Pernambuco] first line of data label: “Caruaru, Brazil” second line: “VII.1972 900 m.” third line: “J. Lima”. Paratype: 1 ♀, same data as holotype (AEIC).

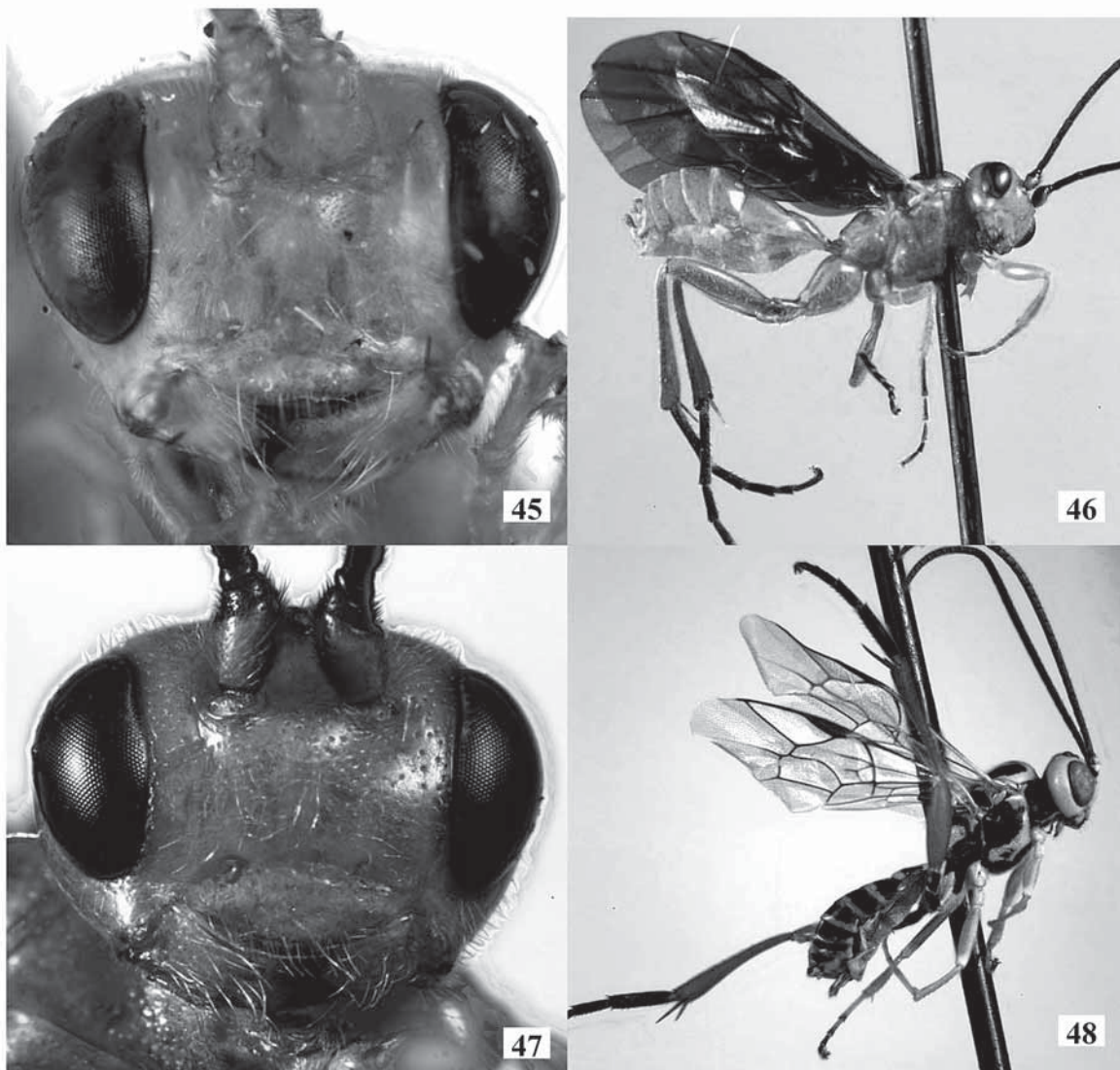
*Remarks.* This species is very similar to *P. glabellus*, collected from the same locality. In addition to the diagnostic features noted above, the first flagellomere is relatively longer and narrower in *P. leucohypopygus*, the hind legs are much darker, and the venation is slightly different, with fore wing cu-a distinctly antefurcal.

The species name is derived from Greek, in reference to the predominately white hypopygium.

### ***Physotarsus luteus* Zhaurova, n. sp. (Figs 6, 42, 43)**

*Diagnosis.* Lateral ocelli separated by 1.0X their widest diameter from each other, and about 1.8X their widest diameter from eye margin. Antenna with 28 flagellomeres. Pronotum completely glabrous, shiny. Mesoscutum shiny, very sparsely punctate on anterior 0.3. T1 about twice as long as broad. Head yellow, with face light brownish medially in holotype. Mesosoma entirely yellow, darker on mesoscutum and sometimes ventrally. Metasoma with T1 yellow, remaining tergites mostly dark yellow with pale yellow apical trim. Hind femur and tibia largely yellow to light orange, tarsomeres dark brown. Fore wing hyaline with faint infumate spot apically.

*Physotarsus luteus* has a distinctive combination of a pale body weakly punctate head and mesothorax. It is most similar to *P. bonillai* in coloration; both species are exceptionally pale with the antenna abruptly transitioning from orange proximally to dark brown apically. *Physotarsus bonillai* lacks the weak punctation on the head and mesoscutum, has a distinctly angulate central lobe protruding from the ventral margin of the clypeus, and has a broader petiole. The fore wing is almost completely hyaline in *P. luteus*.



**FIGURES 45–48.** Habitus and face. 45, *Physotarsus maculipennis*, face. 46–47, *P. melipennis* n. sp.; 46, habitus; 47, face. 48, *P. melotarsus* n. sp., habitus.

*Description. Female:* Body (Fig. 42) 3.7–4.2 mm, fore wing 3.5–4.0 mm. Head (Fig. 43): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe (Fig. 6). Clypeus about 2.7X as wide as long, divided medially by very shallow transverse depression. Face covered with short setae; setae longer, slightly less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.6X width of mandibular base. Face 1.7X as broad as long, weakly convex in profile, sparsely, evenly punctate. Interantennal area flat, area immediately behind toruli weakly concave, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.5X widest diameter of median ocellus. Lateral ocelli separated by 1.0X their widest diameter from each other and about 1.8X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli sharply declivitous. Antenna with 28 flagellomeres, first flagellomere 5.2–5.5X longer than wide, 1.2X widest transverse diameter of eye, second flagellomere 0.7X length of first. Occipital carina present on ventral 0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and upcurved. Lateral groove of pronotum distinct, weakly sculptured on dorsal 0.5. Pronotum glabrous, impunctate, shiny. Mesoscutum shiny, very sparsely and weakly punctate on anterior 0.3. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron



impunctate, sparsely pubescent ventrally. Metapleuron pubescent, more sparsely so posteromedially. Propodeum without carinae; impunctate medially, sparsely pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, about 4.0x longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.3x longer than wide; 2rs-m 1.3–1.4X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.7X length of 2cu-a; cu-a interstitial relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 0.9–1.2X length of rs-m; 1st abscissa of Cu1 1.1–1.6X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile flat basally, very weakly convex posteriorly, dorsal tendon anchored at base of weak median groove, groove not delimited distally; spiracles not or only weakly protruding in profile; dorsolateral carina extending about 0.4X distance to spiracle. Cerci oval to elliptical in outline, not protruding.

*Color.* Head yellow, face light brownish medially in holotype, frons and ocellar triangle dark yellow in holotype. Antenna yellow over approximately basal 0.7–0.8, dark brown apically. Mesosoma entirely yellow, darker on mesoscutum and sometimes ventrally. Metasoma with T1 yellow, remaining tergites mostly dark yellow with narrow, pale yellow transverse band apically. Fore and mid legs largely yellow, with tarsomeres of mid leg somewhat brownish. Hind coxa and femur yellow, with light infumate spot laterally on coxa in holotype, tibia yellow to light orange with brown markings dorsally in holotype, tarsomeres dark brown. Fore wing hyaline with faint infumate spot apically.

*Male:* Unknown.

*Material Examined.* Holotype ♀ (UNAM): [MEXICO] first line of data label: “MEXICO: Yucatan” second line: “Merida, Xmatkuil”, third line: “25 May 1996” fourth line: “R. Wharton”. Paratype: 1 ♀ MEXICO, Jalisco, Estacion Biologica Chamela, 4–5.vii.1993 (R Wharton & M Sharkey) (TAMU).

*Remarks.* The species name is Latin for yellow, referring to the predominately yellow head and body. The species has a disjunct distribution, with one specimen each known from the dry, coastal forests on the Pacific and Caribbean sides of Mexico.

### ***Physotarsus maculipennis* (Cresson, 1874) (Figs 44, 45)**

*Tryphon maculipennis* Cresson, 1874: 392. Lectotype ♂ in Academy of Natural Sciences, Philadelphia.

*Tryphon maculipennis:* Dalla Torre 1902: 298 (catalog); Cresson 1916: 40 (lectotype designation).

*Scolobates maculipennis:* Townes 1946: 39 (new combination).

*Physotarsus maculipennis:* Townes & Townes 1966: 139 (catalog); Townes in Townes & Townes 1966: 330 (description of genus; designation of *P. maculipennis* as type species); Townes 1970b: 102–103 (copy of original generic description, listing the type species); Yu & Horstmann 1997: 455 (catalog).

*Diagnosis.* Lateral ocelli separated by 0.9X their widest diameter from each other, and about 1.8–2.0X their widest diameter from eye margin. Antenna with 35–38 flagellomeres. Pronotum and mesoscutum glabrous, impunctate. T1 about 2.2–2.4X as long as broad. Head entirely orange. Mesosoma mostly orange, sometimes with black markings laterally. Metasomal T1–T3 largely reddish brown. Hind leg orange, tarsomeres 2–4 pale yellow to nearly white. Fore wing fuscous, with at least one pale yellowish spot or band distally (Fig. 44).

This species is most similar to *P. varicornis*, with which it shares the smooth body, pectinate claws, and dark wing with pale subapical band. *Physotarsus varicornis* is a distinctly darker species.

*Description. Female:* Body (Fig. 44) 8.3–9.7 mm, fore wing 9.0–9.2 mm. Head (Fig. 45): Clypeal margin widely truncate laterally, with thick, somewhat broadly angulate central lobe. Clypeus about 3.0X as wide as long, divided medially by transverse depression, with two small basolateral lobes weakly protruding in profile. Face densely covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.5–0.6X width of mandibular base. Face 1.8X as broad as long, prominently protruding medially, face densely, finely punctate. Interantennal area flat, area immediately

behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.4X widest diameter of median ocellus. Lateral ocelli separated by 0.9X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli not sharply declivitous. Antenna with 38 flagellomeres, first flagellomere 3.8–4.5X longer than wide, 1.4X widest transverse diameter of eye, second flagellomere 0.6X length of first. Occipital carina present on ventral 0.2–0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded, slightly upcurved. Lateral groove of pronotum unsculptured, present on dorsal 0.3. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron largely impunctate medially, weakly punctate to nearly impunctate and sparsely pubescent ventrally. Propodeum with pleural carina complete to variously interrupted medially; impunctate medially, quite densely setose laterally. Tarsal claws almost fully pectinate. Fore wing stigma narrow, about 4.1–4.4X longer than wide; Rs+2r arising from basal 0.35–0.40 of stigma; marginal cell about 2.5–3.1X longer than wide; 2rs-m 1.3–2.5X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.8–0.9X length of 2cu-a; cu-a weakly antefurcal, rarely interstitial relative to Rs&M. Hind wing M+Cu nearly straight; basal abscissa of Rs about 1.4X longer than rs-m; 1st abscissa of Cu1 about 2.0–3.0X longer than cu-a. Metasoma: T1 about 2.2–2.4X as long as broad; surface in profile concave basally, evenly convex over posterior 0.7–0.8, dorsal tendon anchored within distinct depression, depression gradually becoming shallower posteriorly, continuing for most of length of T1 as a shallow median groove; spiracles usually weakly protruding in profile; dorsolateral carina usually extending about 0.6–0.8X distance to spiracle. Cerci short but distinctly protruding.

*Male.* Antenna with 35–36 flagellomeres, first flagellomere 4.3–5.0X longer than wide. Venation more variable than in female: Fore wing 2rs-m 0.9–2.2X length of abscissa of M between 2rs-m and 2m-cu. Hind wing with basal abscissa of Rs 1.4–1.8X longer than rs-m; 1st abscissa of Cu1 about 1.7–4.0X longer than cu-a. Subgenital plate with margin widely truncate, not emarginate. Aedeagal margin not toothed. Otherwise as in female.

*Color.* Head varying from orange to dark orange, 25% of specimens with small black crescents immediately posteriorad antenna. Antenna usually orange basally, pale orange to yellow in middle and subapically, with apical 1–6 flagellomeres usually (85%) dark brown. Mesosoma mostly orange, half of specimens with black markings laterally, maximally as a lateral streak extending along anterior margin of pronotum, across middle of mesopleuron, ventral margin of metapleuron, and onto base of petiole. Metasoma with T1–T3 usually reddish brown, though varying from orange to brown, remaining tergites usually pale orange. Anterior two pairs of legs orange to pale orange basally (usually through femur), becoming pale orange to yellow distally. Hind leg orange with tarsomeres 2–4 always, 1 and/or 5 sometimes pale yellow to nearly white. Fore wing fuscous basally, infumate apically and ventroapically, with large, pale yellowish spot or band subapically distad stigma and often (50%) with additional pale spot or band immediately basad stigma; stigma dark (Fig. 44).

*Material Examined.* Lectotype ♂ (ANSP, Type No. 874.1): [MEXICO, Orizaba] only line on data label: “MEX.” Additional material examined: MEXICO, Chiapas, 1 ♀ 3 mi N Arriaga, 16.ix.1967 (RH&EM Painter) (AEIC), 20–25 mi N Huixtla, 3000 ft, 1.vi.1969 (Peterson) (CNC); 1 ♂ Durango, 5–10 mi SE Durango, 6500 ft, 9.vii.1972 (B&C Dasch) (AEIC); Jalisco, 1 ♀ Chapala, 15.x.1968 (GE Bohart) (AEIC), 1 ♀ Guadalajara, 16.vii.1951 (HE Evans) (AEIC), 1 ♂ same locality, 23.vii.1939 (CH Townes) (AEIC); San Luis Potosi, 1 ♀ El Salto, 21.vii.1962 (AEIC), 1 ♀ 6 mi E. Xilitla, 2000 ft, 31.vii.1962 (RH&EM Painter) (AEIC), 1 ♂ Xilitla, 30.vii.1962 (RH&EM Painter) (AEIC); 1 ♂ Sinaloa, 20 mi E Concordia, 3000 ft, 12.viii.1964 (Mason) (CNC); Veracruz, 1 ♂ 34 mi E Jalapa Puente Nacional, 18.viii.1960 (Howden) (CNC), 1 ♂ Orizaba, 4079 ft, 27.vi.1972 (B&C Dasch) (AEIC).

*Remarks.* Specimens available for study represent a diversity of localities throughout Mexico and exhibit a considerable amount of variation. The most readily observed differences are in the color patterns on the mesosoma and wings, and in the relative lengths of the fore wing 2rs-m cross-vein and hind wing cu-a. The

most variable features were not correlated, thus darker specimens were variable in number of pale spots on the wing and in relative length of the wing veins. Details of the color variation are noted in the redescription, which is based on all the material examined except for the specimen from Durango, which has the wings more nearly hyaline basally and is thus only doubtfully included here. In the lectotype, the mesosoma is completely orange (lacking dark markings laterally and on the pronotum), and the fore wing has a single, rounded, discrete, pale spot extending from the anterior margin immediately distad stigma to and almost or barely touching distal abscissa of M. Both flagella are completely absent on the lectotype, but in the original description, the flagellum is described as honey yellow basally, black apically, and with a broad, pale yellow band subapically. We have interpreted this as a single, variable species but once longer series from single localities become available, it may be possible to delineate additional species.

***Physotarsus melipennis* Zhaurova, n. sp. (Figs 46, 47)**

*Diagnosis.* Lateral ocelli separated by about 1.6X their widest diameter from each other and about 2.8X their widest diameter from eye margin. Antenna with 33–36 flagellomeres. Pronotum sparsely to moderately punctate. Mesoscutum shiny, sparsely punctate on anterior 0.4. T1 about twice as long as broad. Head, mesosoma, and metasoma entirely orange. Antennae black dorsally, brown to light brown ventrally. Hind femur and most of tibia orange, tarsomeres black. Fore wing entirely fuscous.

This distinctively colored species superficially resembles *P. maculipennis* because of the dark wings and orange body, but is smaller, more heavily sculptured, and lacks the pale bands/spots on the wing.

*Description. Female:* Body (Fig. 46) 5.0–6.8 mm, fore wing 4.6–5.5 mm. Head (Fig. 47): Clypeal margin widely rounded laterally with thick, rounded central lobe; Clypeus about 2.0X as wide as long. Face sparsely covered with very short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate, pointed laterally. Malar space about 0.4X width of mandibular base. Face about 2.0X as broad as long, evenly punctate, slightly bulging medially. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance about 1.2X the distance between lateral ocelli. Widest diameter of torulus about 1.4X widest diameter of median ocellus. Lateral ocelli separated by about 1.6x their widest diameter from each other and about 2.8X their widest diameter from eye margin. Area between lateral ocelli strongly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 33–36 flagellomeres, first flagellomere 4.2–4.8X longer than wide, 1.3X widest transverse diameter of eye, second flagellomere about 0.6–0.7X length of first. Occipital carina present on ventral 0.5 of head. Mesosoma: Anterior margin of pronotum broadly truncate, flat medially, slightly upcurved laterally. Lateral groove of pronotum present on dorsal 0.4, broader, often less distinct among crenulate-rugose sculpture ventrally. Pronotum sparsely to moderately punctate, heavily crenulate-rugose ventrally. Mesoscutum shiny, sparsely punctate on anterior 0.4. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron deeply and distinctly punctate, densely so dorsally, with very small impunctate area. Metapleuron almost uniformly densely setose. Propodeum with pleural carina complete or nearly so, sometimes weakly developed; narrowly impunctate posteromedially, densely punctate laterally. Tarsal claws simple. Fore wing stigma roughly 3.5X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.0X longer than wide; 2rs-m 1.5–1.8X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 1.0X length of 2cu-a; cu-a weakly to distinctly antefurcal relative to Rs&M. Hind wing M+Cu weakly bowed; basal abscissa of Rs 1.1–1.2X longer than rs-m; 1st abscissa of Cu1 1.2–2.5X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile weakly concave anteriorly, weakly convex posteriorly, weak median, longitudinal groove extending from basal depression nearly to apex, dorsal tendon anchored on almost flat surface anteriorad depression; spiracles not or only weakly protruding; dorsolateral carina extending about 0.7–0.8X distance to spiracle. Cerci conical, protruding.



**Color.** Head, mesosoma, and metasoma entirely orange. Antennae black dorsally, brown to light brown ventrally. Fore and mid legs mostly orange, tarsomeres usually brown, tibia sometimes weakly infumate dorsally; hind femur and most of tibia orange, tibia dorsally darkening apically, tarsomeres black. Fore wing entirely fuscous.

**Male:** Unknown.

**Material Examined.** Holotype ♀ (AEIC, Type No. 3857): [USA, Arizona] first line of data label: "Portal, Ariz." second line: "VIII.17.1974" third line: "H. & M. Townes". Paratypes: 4 ♀, same data as holotype except dates ranging 13–30.viii.1974 (H&M Townes) (AEIC).

**Remarks.** In two of the paratypes, the occipital carina is complete or nearly so, though much weaker and somewhat decurved dorsally. No other New World Scolobatini have a complete occipital carina, and these specimens are considered aberrant in this regard though otherwise agreeing with the other specimens examined. The color of the dorsal surface of the hind tibia varies from almost entirely orange to almost entirely black, with the majority of the specimens having at least the apical half black.

The species name is derived from the Greek *melas*, dark or black and the Latin *pennis*, wing, in reference to the dark wings. This species is one of three described here known only from the southeastern Arizona.

### ***Physotarsus melotarsus* Zhaurova, n. sp. (Figs 48, 49)**

**Diagnosis.** Lateral ocelli separated by 1.8X their widest diameter from each other and 1.7X their widest diameter from eye margin. Antenna with 27–28 flagellomeres. Pronotum impunctate, rugose medially and along posterior margin. Mesoscutum densely punctate over entire surface. T1 about 1.6–1.8X as long as broad. Face yellow, frons medially and occiput black. Mesosoma black and yellow (Fig. 48). Metasomal tergites mostly black with apical margins yellow. Hind femur and tibia orange, tarsomeres and pretarsus black. Fore wing entirely hyaline.

*Physotarsus melotarsus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a completely hyaline wing. It differs from all but *P. foveatus* and *P. tonicus* in having the entire mesoscutum deeply punctate. The face is completely yellow in *P. melotarsus* and partially to completely black medially in *P. foveatus* and *P. tonicus*.

**Description. Female:** Body (Fig. 48) 4.0–4.5 mm, fore wing 3.6–3.8 mm. Head (Fig. 49): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 2.6X as wide as long, divided medially by very shallow transverse depression. Face covered with short to very short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.2–0.3X width of mandibular base. Face about 2.2X as broad as long, strongly protruding in profile, densely punctate, slightly more so medially than laterally. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance about equal distance between lateral ocelli. Widest diameter of torulus 1.3X widest diameter of median ocellus. Lateral ocelli separated by 1.8x their widest diameter from each other and 1.7X their widest diameter from eye margin. Area between lateral ocelli quite strongly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 27–28 flagellomeres, first flagellomere 3.5–4.2X longer than wide, 0.8X widest transverse diameter of eye, second flagellomere 0.8x length of first. Occipital carina present on ventral 0.7 of head. Mesosoma: Anterior margin of pronotum medially very slightly emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum complete though usually weak ventrally, broadly rugose. Pronotum impunctate, rugose medially and along posterior margin. Mesoscutum densely punctate over its entire surface. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron strigose dorsomedially, otherwise densely punctate with small impunctate area. Metapleuron uniformly densely setose. Propodeum with posterior vestige of pleural carina, or without carinae entirely; narrowly impunctate posteromedially, densely punctate laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, about 3.8–4.0X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 2.8–

2.9X longer than wide; 2rs-m 1.3–2.2X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.5X length of 2cu-a; cu-a weakly antefurcal, rarely interstitial relative to Rs&M. Hind wing M+Cu bowed; basal abscissa of Rs 1.0–1.2X length of rs-m; 1st abscissa of Cu1 1.6–3.1X longer than cu-a. Metasoma: T1 about 1.6–1.8X as long as broad; surface in profile with basal depression gradually becoming flat medially, weakly convex posteriorly, dorsal tendon anchored at base of depression; spiracles not or only weakly protruding in profile; dorsolateral carina extending about 0.5–0.7X distance to spiracle. Cerci protruding less than basal width.

*Male:* Antenna with 30 flagellomeres. Male subgenital plate evenly, weakly convex. Otherwise as in female, except as noted below.

*Color.* Head mostly yellow, ocellar field and occiput black, with triangular extension from ocellar field onto frons, small black spot immediately posteriad antenna. Antenna gradually darkening from orange apically to dark brown basally, more extensively brown dorsally than ventrally. Mesoscutum black with yellow bands laterally and along notaular lines, scutellum yellow except at extreme base. T1 mostly black with narrow yellow stripe laterally from base to spiracle and broad apical transverse band yellow; remaining tergites mostly black with apical margins yellow. Fore and mid coxa yellow, femur and tibia orange posteriorly, otherwise variously yellow to pale orange, tarsomeres yellow, sometimes apical tarsomeres infumate. Hind coxa mostly black with varying amount of yellow, trochanter and trochantellus mostly black, femur and tibia orange, tarsomeres and pretarsus black. Male with hind coxa, propodeum, and T1 more extensively black. Fore wing entirely hyaline.

*Material Examined.* Holotype ♀ (TAMU): [USA, Texas] first line of data label: “Casa Blanca Intern.” second line: “St. Park, Laredo, TX” third line: “III-8-01, At Light” fourth line: “After 11:00 pm” fifth line: “W.F. Chamberlain”. Paratypes: Texas, 1 ♂ Crockett Co., 16.7 mi W Ozona, 9.v.1997 (Gillooly & Schaffner) (TAMU), 2 ♀ Fredericksburg, 5 & 7.v.1998 (H&M Townes) (AEIC), 1 ♀ 8 mi SW Port Mansfield, 18.iii.1994 (WF Chamberlain) (TAMU), 1 ♀ San Ygnacio, 18.iii.1994 (WF Chamberlain) (TAMU), 1 ♀ Sutton Co., 16 mi W Sonora, 11.v.1997 (Gillooly & Schaffner) (TAMU). Additional material (not paratype): 1 ♂ Texas, Sinton, vi.1975 (V Nealis) (AEIC).

*Remarks.* The holotype was collected at light after 11 pm; one of the paratypes was also collected at light. The species is thus likely to be nocturnal.

We also examined 1 ♀ specimen, possibly representing a different species, collected from Andreas Canyon, Palm Springs, CA (CNC). It is very similar to *P. melotarsus*, but with hind tarsomeres orange to light brown.

The species name is derived from Greek, referring to the black hind tarsomeres.

### ***Physotarsus montezuma* (Cameron, 1886)**

*Mesoleius montezuma* Cameron, 1886: 286. Holotype ♂ in BMNH.

*Mesoleius montezuma*: Townes in Townes & Townes 1966: 139 (transfer to *Physotarsus*, status of type specimen).

*Scopesis flavolineatus* Cameron, 1904: 254. Holotype ♂ in BMNH.

*Scopesis flavolineatus*: Townes in Townes & Townes 1966: 139 (as synonym of *montezuma*).

*Physotarsus montezuma*: Townes & Townes 1966: 139 (catalog, synonymy); Yu & Horstmann 1997: 455 (catalog).

*Diagnosis.* Lateral ocelli separated by 1.3X their widest diameter from each other and 1.4X their widest diameter from eye margin. Pronotum punctate throughout, rugose along lateral groove and posterior margin. Mesoscutum densely punctate over anterior 0.3. T1 about 2.2X as long as broad. Face yellow medially, frons, most of vertex, and occiput black. Mesosoma almost entirely black. T1 yellow anteriorly, black posteriorly, remaining tergites black with apical margins yellow. Hind legs almost entirely black. Fore wing entirely hyaline.

This species differs from all others with a distinctly punctate mesopleuron by the more nearly completely black mesosoma. It is most similar to darker specimens of *P. tonicus*, which also have about the same pattern

of punctation on the mesoscutum. The fore and mid femora are at least partly dark brown to black in *P. tonicus* and yellow in *P. montezuma*.

**Description.** *Male:* Body 5.6 mm, fore wing 4.8 mm. Head: Clypeal margin evenly rounded, with thick, rounded central lobe. Clypeus about 2.9X as wide as long, not divided medially by shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elliptical. Malar space 0.6X width of mandibular base. Face about 1.7X as broad as long, dorsally convex in profile, densely punctate, slightly more so medially than laterally and ventrolaterally. Interantennal area flat, area immediately behind antennae weakly concave laterally turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance about equal distance between lateral ocelli. Widest diameter of torulus 1.3X widest diameter of median ocellus. Lateral ocelli separated by 1.3x their widest diameter from each other and 1.4X their widest diameter from eye margin. Area between lateral ocelli depressed, area immediately behind ocelli not sharply declivitous. Both antennae broken near base, first flagellomere 7.5X longer than wide, 1.6X widest transverse diameter of eye, second flagellomere 0.7X length of first. Occipital carina present on ventral 0.2 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and slightly upcurved. Lateral groove of pronotum complete to posterior margin, crenulate-rugose. Pronotum punctate throughout, slightly less so medially, rugulose along posterior margin. Mesoscutum densely punctate and setose over anterior 0.3, smooth and bare or nearly so posteriorly. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron very densely punctate and setose with small impunctate area. Metapleuron uniformly densely setose. Propodeal carinae difficult to see on holotype, at least posterior portion of pleural carina distinct; narrowly impunctate to sparsely punctate along midline, densely punctate laterally. Tarsal claws not pectinate. Fore wing 2rs-m 2.1X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.6-0.7X length of 2cu-a; cu-a very weakly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.0–1.1X length of rs-m; 1st abscissa of Cu1 about equal length of cu-a. Metasoma: T1 about 2.2X as long as broad; surface in profile with shallow basal depression gradually becoming flat medially, convex posteriorly, dorsal tendon anchored at base of depression; spiracles not protruding in profile; dorsolateral carina extending about 0.5X distance to spiracle. Cerci oval, not or only scarcely protruding.

**Color.** Head mostly black, clypeus, mandible except apical teeth, face medially, and a broad orbital spot on either side of ocellar field yellow. Scape, pedicel and basal three flagellomeres black, remaining flagellomeres missing. Mesosoma entirely black except meso- and metascutellum yellow. T1 yellow on basal half, black on posterior half with posterior margin yellow; remaining tergites black with narrow apical yellow margin, yellow margin broader posteriorly. Fore and mid legs yellow, with coxae dark brown ventrally and tarsomeres becoming infumate distally. Hind legs missing; from original description coxa and tarsomeres black, femur and tibia beneath paler (yellow tinged with fulvous). Fore wing entirely hyaline.

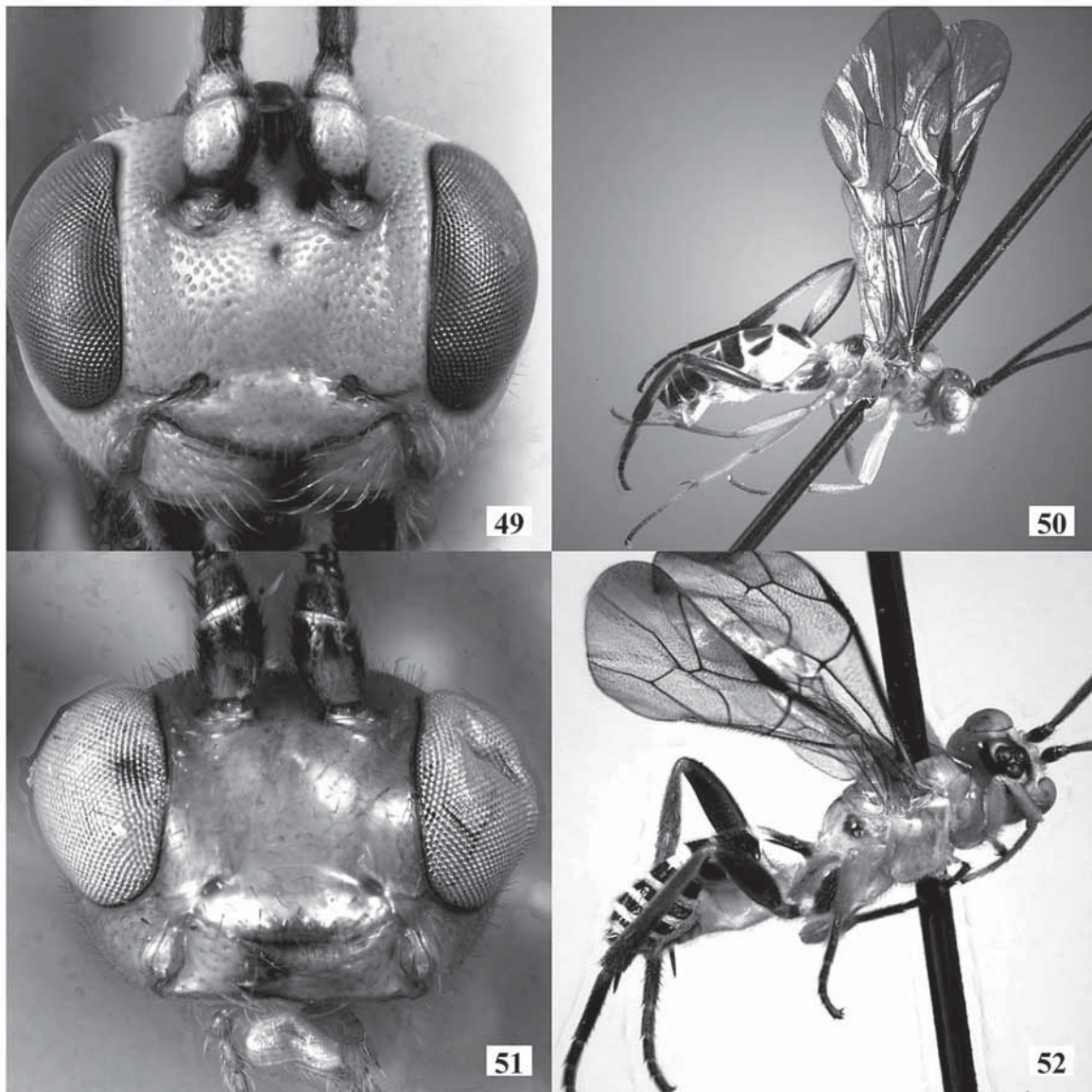
**Material Examined.** Presumed holotype ♂ MEXICO (BMNH).

**Remarks.** Townes (1966) stated that the nominal species *Mesoleius montezuma* Cameron, 1886 and *Scopesis flavolineatus* Cameron, 1904 were based on the same type specimen, though he did not provide additional information that lead him to this conclusion. Townes (1966) implied that there was a single specimen on which the respective descriptions were based, but Cameron (1886, 1904) does not explicitly say this, indicating in both cases only that the species was described from the male.

This type specimen is in very poor condition, with hind legs completely missing, antennae broken beyond the third flagellomere, and metasoma glued to one of the labels. There are five labels. The uppermost label is a round, red-margined type label. This is followed by a “B. M. Type Hym 3b1114” label, then a third, hand-written (possibly by Cameron) label that reads “*Scopesis flavolineatus* Cam. Type Mexico”. The fourth label is an accessions label that reads “Cameron Coll. 1904-313”, and the fifth a red hand-written label by Townes that reads “Type *Mesoleius montezuma* Cam Tow ’64”. There is no separate locality label, but published information (Cameron 1886 but not in Cameron 1904) lists the locality as “Mexico: Ciudad in Durango 8100 ft (*Forrer*).” The shape of the clypeus, reduction of the occipital carina, lack of fore wing areolet, and inflated



hind tarsi (the latter as figured by Cameron 1886) indicate that this is a typical member of the genus as characterized here.



**FIGURES 49–52.** Habitus and face. 49, *Physotarsus melotarsus* n. sp., face. 50–51, *P. niveus* n. sp.; 50, habitus; 51, face. 52, *P. oculatus* n. sp., habitus.

***Physotarsus niveus* Zhaurova, n. sp. (Figs 50, 51)**

*Diagnosis.* Lateral ocelli separated by about 0.6X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Antenna with 24–27 flagellomeres. Pronotum and mesoscutum shiny, impunctate. T1 about 2.2X as long as broad. Anterior margin of clypeus white, rest of clypeus, head and mesosoma orange except anteromedian 0.6 of propodeum brown, rest white. Metasoma with T1 white anteriorly, brown posteriorly; rest of tergites brown with narrow, white apical margins. Hind leg dark brown to black except posteriorly and ventrally coxa, most of femur, and part of tibia white. Fore wing hyaline, apex weakly infumate.

*Physotarsus niveus* is similar to several other smooth-bodied species that have hyaline wings with an infumate apical spot, most notably *P. eliethi*, *P. glabellus*, *P. jamesi*, *P. leucohypopygus*, and *P. oculatus*. As

in *P. leucohypopygus* and *P. oculatus* the hind femur on the outer or anterior face is entirely or almost entirely dark brown to black in *P. niveus* but unlike the other two species, the hind femur is extensively white on the posterior face. The ocellar field is dark brown in *P. oculatus* but the head above is completely orange in *P. leucohypopygus* and *P. niveus*. The propodeum is entirely orange in *P. leucohypopygus* but dark brown anteriorly and white posteriorly in *P. niveus*.

**Description. Female:** Body (Fig. 50) 5.2–5.8 mm, fore wing 5.5 mm. Head (Fig. 51): Clypeal margin widely rounded laterally, with thick, somewhat angulate central lobe. Clypeus about 2.8X as wide as long, not divided medially by transverse depression. Face sparsely covered with short to moderately long setae; setae slightly longer, less dense on clypeus. Anterior tentorial pits oval. Malar space about 0.5X width of mandibular base. Face about 1.5–1.6X as broad as long, mostly weakly convex in profile, more strongly protruding at dorsal tubercle, smooth. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.8 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus about equal widest diameter of median ocellus. Lateral ocelli separated by about 0.6X their widest diameter from each other and about 2.0X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area behind ocelli sharply declivitous. Antenna with 24–27 flagellomeres, first flagellomere 5.2X longer than wide, 0.9X widest transverse diameter of eye, second flagellomere about 0.7X length of first. Occipital carina present on ventral 0.2 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally truncate and slightly upcurved. Lateral groove of pronotum unsculptured, weak, present on dorsal 0.2. Pronotum and mesoscutum shiny, impunctate. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Metapleuron sparsely, unevenly setose. Propodeum with distinct posterior vestiges of both median longitudinal and pleural carinae; impunctate medially, sparsely pubescent laterally. Tarsal claws basally pectinate. Fore wing stigma narrow, about 4.5X longer than wide; Rs+2r arising from basal 0.3 of stigma; marginal cell about 3.0X longer than wide; 2rs-m 1.2X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a interstitial to weakly antefurcal relative to Rs&M. Hind wing M+Cu strongly bowed; basal abscissa of Rs 1.0–1.2X length of rs-m; 1st abscissa of Cu1 exceptionally variable, 2.3–4.3X longer than cu-a. Metasoma: T1 about 2.2X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored within deep, discrete depression; spiracles protruding in profile; dorsolateral carina protruding laterally at base, extending 0.7–0.8x distance to spiracle. Cerci distinct, round to slightly ovate, nearly flat.

**Male:** Body 4.8mm. First flagellomere 5.7X longer than wide; 1st abscissa of Cu1 in hind wing 2.2–2.8X longer than cu-a; subgenital plate small, transparent, weakly sclerotized, weakly convex. Otherwise as in female.

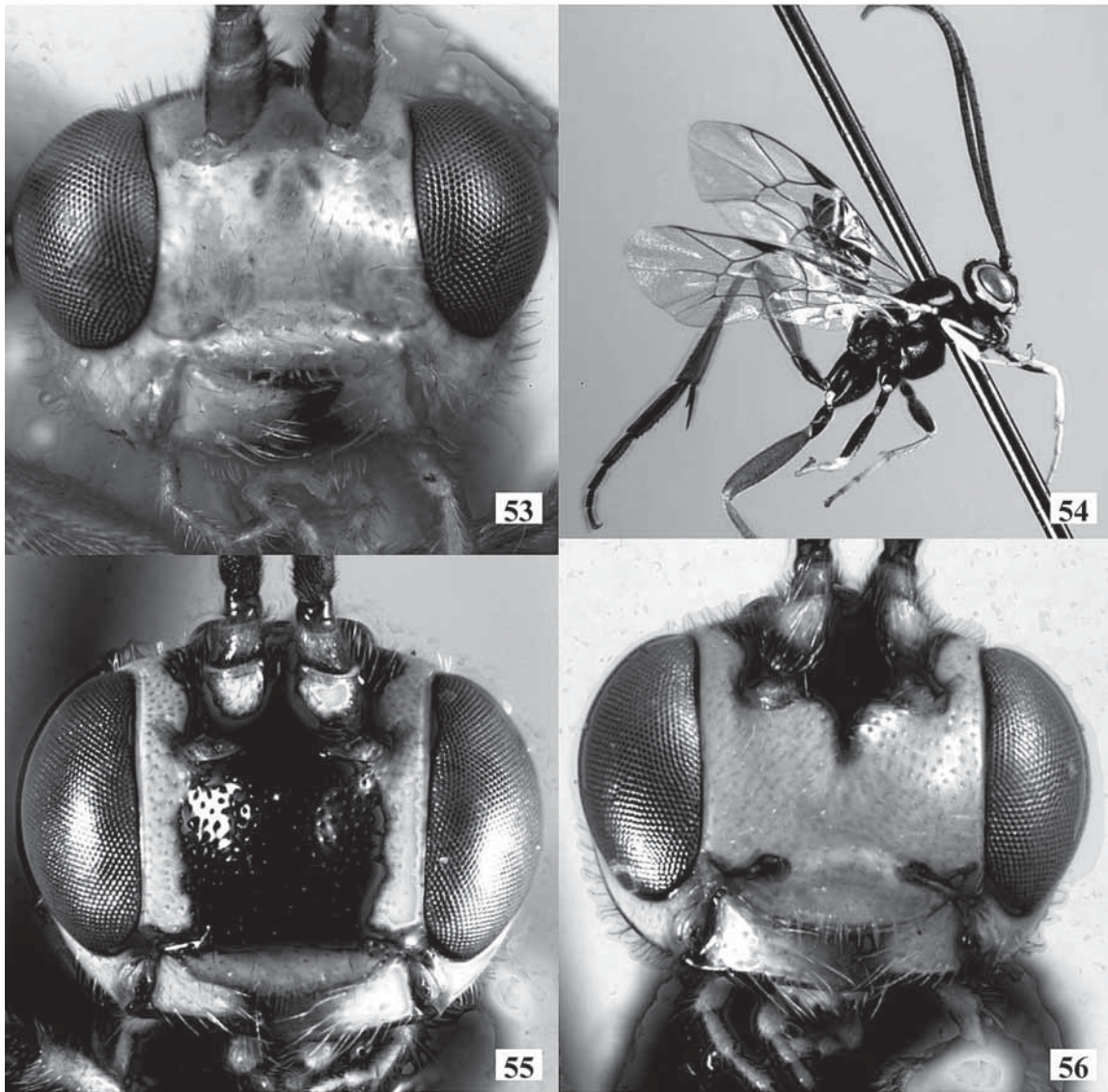
**Color.** Anterior margin of clypeus white, rest of clypeus, head, and most of mesosoma orange. Antenna dark brown to black in female, brown to light brown at base in male. At least anteromedian 0.6 of propodeum brown, rest white. Metasoma with T1 white anteriorly in holotype, brown posteriorly, entirely dark brown in paratypes; rest of tergites brown with narrow white apical margins, sternites white, cerci brown. Coxa of fore and mid legs white, femora and tibiae pale orange, mid and sometimes fore tarsomeres usually brown. Hind leg dark brown to black except white posteriorly and ventrally on coxa, most of femur, and part of tibia. Fore wing hyaline, apex weakly infumate.

**Material Examined.** Holotype ♀ (AEIC, Type No. 3858): [BRAZIL, São Paulo] first line of data label: “S.J. Barreiro,” second line: “Serra da Bocaina,” third line: “Braz. 1650m, XI-68” fourth line: “Alvarenga&Seabra”. Paratypes: BRAZIL, 1 ♀, same data as holotype except xi.1969 (AEIC), 1 ♂ [Rio de Janeiro?] Guan., Floresta da Tijuca, iv.1969 (Alvarenga & Seabra) (AEIC), 1 ♂ Minas Gerais, Serra do Caraça, S. Barbara, 1600 m, iv.1969 (FM Oliveira) (AEIC).

**Remarks.** The holotype and one of the paratypes were collected from highlands (1650 m). The species is known only from southwestern Brazil.

The species name is derived from Latin, referring to the white markings at the apex of the propodeum, and the base of the petiole in the holotype.





**FIGURES 53–56.** Habitus and face. 53, *Physotarsus oculatus* n. sp., face. 54–56, *P. tonicus* n. sp.; 54, habitus; 55, face ♀; 56, face ♂.

***Physotarsus oculatus* Zhaurova, n. sp. (Figs 52, 53)**

**Diagnosis.** Lateral ocelli separated by about 0.8X their widest diameter from each other and about 1.5X their widest diameter from eye margin. Antenna with 27 flagellomeres. Pronotum and mesoscutum impunctate, shiny. T1 about 2.2X as long as broad. Face white or very light yellow; ocellar area dark brown, lateral frons and occiput orange. Mesosoma with pronotum brown anteriorly, white posteriorly; mesoscutum and scutellum orange; mesopleuron white; propodeum white with two anterolateral brown spots. Metasomal tergites brown with apical margins white, sternites white. Hind legs entirely black. Fore wing hyaline, apex infumate to nearly fuscous.

*Physotarsus oculatus* is similar to several other smooth-bodied species that have hyaline wings with an infumate apical spot, most notably *P. eliethi*, *P. glabellus*, *P. jamesi*, *P. leucohypopygus*, and *P. niveus*. As in *P. leucohypopygus* and *P. niveus* the hind femur on the outer or anterior face is entirely or almost entirely dark brown to black in *P. oculatus* but unlike the other two species, the ocellar field is dark brown in *P. oculatus*.



*Description. Female:* Body (Fig. 52) 4.4–4.7 mm, fore wing 4.0–4.3 mm. Head (Fig. 53): Clypeal margin widely truncate laterally with thick, somewhat angulate central lobe. Clypeus about 3.4X as wide as long, separated medially by shallow transverse depression. Face covered with short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate, pointed laterally. Malar space about 0.5X width of mandibular base. Face about 1.4X as broad as long, nearly flat, weakly convex dorsally, sparsely, evenly punctate. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus about equal widest diameter of median ocellus. Lateral ocelli separated by about 0.8X their widest diameter from each other and about 1.5X their widest diameter from eye margin. Area between lateral ocelli slightly depressed, area immediately behind ocelli sharply declivitous. Antenna with 27 flagellomeres, first flagellomere 4.4–4.8X longer than wide, about 0.7X widest diameter of eye; second flagellomere about 0.7X length of first. Occipital carina present on ventral 0.4 of head. Mesosoma: Anterior margin of pronotum strongly emarginate medially, laterally truncate and slightly upcurved. Lateral groove of pronotum weak, unsculptured, present on dorsal 0.4. Pronotum and mesoscutum glabrous, impunctate, shiny. Epicnemial carina strongly angled towards anterior margin of mesopleuron. Mesopleuron shiny, very sparsely punctate on ventral 0.7. Metapleuron unevenly setose. Propodeum with posterior vestige of pleural carina; impunctate medially, sparsely pubescent laterally. Tarsal claws with stout setae basally. Fore wing stigma narrow, about 4.3X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 2.9X longer than wide; 2rs-m usually 1.9–2.1X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.4X length of 2cu-a; cu-a weakly antefurcal relative to Rs&M. Hind wing M+Cu bowed to strongly bowed; basal abscissa of Rs 1.4X length longer than rs-m; 1st abscissa of Cu1 about 3.2–4.2X longer than cu-a. Metasoma: T1 about 2.2X as long as broad; surface in profile flat for most of length, very weakly convex posteriorly, dorsal tendon anchored within small, relatively discrete depression; spiracles weakly protruding in profile. Subgenital plate widely rounded, larger than usual. Cerci not protruding.

*Color.* Face white or very light yellow; ocellar area dark brown, lateral frons and occiput orange. Antenna uniformly yellowish. Mesosoma with anterior part of pronotum brown; posterior part white; mesoscutum and scutellum orange; mesopleuron white; propodeum white with two lateral brown spots. Metasomal tergites brown with white margins, sternites white. Subgenital plate white with thin brown apical margin. Cerci brown. Fore legs yellow, mid legs yellow with black tarsomeres. Hind legs entirely black. Fore wing hyaline, apex infumate to nearly fuscous.

*Male:* Unknown.

*Material Examined.* Holotype ♀ (AEIC, Type No. 3859): [BRAZIL, Pará] first line of data label: “Jacareacanga” second line: “Pará, Braz. XII-68” third line: “Moacir Alvarenga”. Paratype: 1 ♀, same data as holotype (AEIC).

*Remarks.* The species name is derived from Latin, referring to the large, bulging eyes. This is *Physotarsus* species 2 in the analyses conducted by Zhaurova and Wharton (2009).

### ***Physotarsus tonicus* Zhaurova, n. sp. (Figs 54–56)**

*Diagnosis.* Lateral ocelli separated by about 1.6X their widest diameter from each other and about 1.4X their widest diameter from eye margin. Antenna with 27–31 flagellomeres. Pronotum impunctate, rugose medially and along posterior margin. Mesoscutum densely, irregularly punctate. T1 about twice as long as broad. Head mostly black in female, with most of clypeus, mandibles, and complete ocular ring yellow, male with face entirely or almost entirely yellow. Mesosoma almost entirely black, some yellow pigment sometimes present laterally on mesoscutum and propodeum. Metasomal tergites mostly black with narrow, white apical margin. Hind femur and tibia orange, coxa, trochanter, trochantellus, tarsomeres, and pretarsus black. Fore wing entirely hyaline.

*Physotarsus tonicus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a completely hyaline wing. It differs from all but *P. foveatus* and *P. melotarsus* in having the entire mesoscutum deeply punctate. The face is completely yellow in *P. melotarsus* and partially to completely black medially in *P. foveatus* and *P. tonicus*. The fore and mid femora are extensively dark brown to black in *P. tonicus* and yellow to orange in *P. foveatus*.

**Description. Female:** Body (Fig. 54) 3.7–4.8 mm, fore wing 3.2–4.0 mm. Head (Fig. 55): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 2.8–3.0X as wide as long, divided medially by very shallow transverse depression. Face covered with short to very short setae; setae only slightly longer, less dense on clypeus. Anterior tentorial pits elongate, pointed laterally. Malar space small, about 0.2–0.3X width of mandibular base. Face 1.7–1.8X as broad as long, strongly protruding in profile, densely, evenly punctate. Interantennal area flat, area immediately behind antenna weakly concave turning convex laterally before reaching ocelli. Anterior margin of torulus situated at about 0.6 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus about 1.4X widest diameter of median ocellus. Lateral ocelli separated by about 1.6X their widest diameter from each other and about 1.4X their widest diameter from eye margin. Area between lateral ocelli strongly depressed, area immediately behind ocelli not sharply declivitous. Antenna with 27–31 flagellomeres, first flagellomere 4.0–4.3X longer than wide, 0.8X widest transverse diameter of eye, second flagellomere 0.7–0.8X length of first. Occipital carina present on ventral 0.7–0.8 of head. Mesosoma: Anterior margin of pronotum medially emarginate, laterally rounded, slightly upcurved. Lateral groove of pronotum strong, complete to posterior margin, shallow and broadly rugose ventrally. Pronotum impunctate, rugose medially and along posterior margin. Mesoscutum densely, irregularly punctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron with prominent impunctate area. Metapleuron almost uniformly densely setose. Propodeum with pleural carina vestigial to weak but complete; narrowly impunctate posteromedially, densely punctate laterally. Tarsal claws with stout setae basally. Metapleuron almost uniformly densely setose. Fore wing stigma 3.5–3.8X longer than wide; Rs+2r arising from basal 0.4 of stigma; marginal cell about 3.0X longer than wide; 2rs-m 1.1–1.8X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.8X length of 2cu-a; cu-a interstitial to weakly antefurcal relative to Rs&M. Hind wing M+Cu bowed to strongly bowed; basal abscissa of Rs 0.9–1.3X length of rs-m; 1st abscissa of Cu1 2.6–3.6X longer than cu-a. Metasoma: T1 about 2.0X as long as broad; surface in profile concave basally, nearly flat medially, moderately convex posteriorly, dorsal tendon anchored within base of broad depression, depression gradually becoming shallower over anterior half; spiracle not or only weakly protruding in profile; dorsolateral carina extending from 0.5–1.0X distance to spiracle, often weakly developed. Cerci small, round to slightly ovate, very weakly protruding.

**Male:** Subgenital plate elongate, apical margin widely truncate, even, aedeagal margin not toothed. First flagellomere slightly broader, 3.7–4.0X longer than wide. 1st abscissa of Cu1 in hind wing 2.1–3.2X longer than cu-a. Otherwise as in female except for color difference noted below.

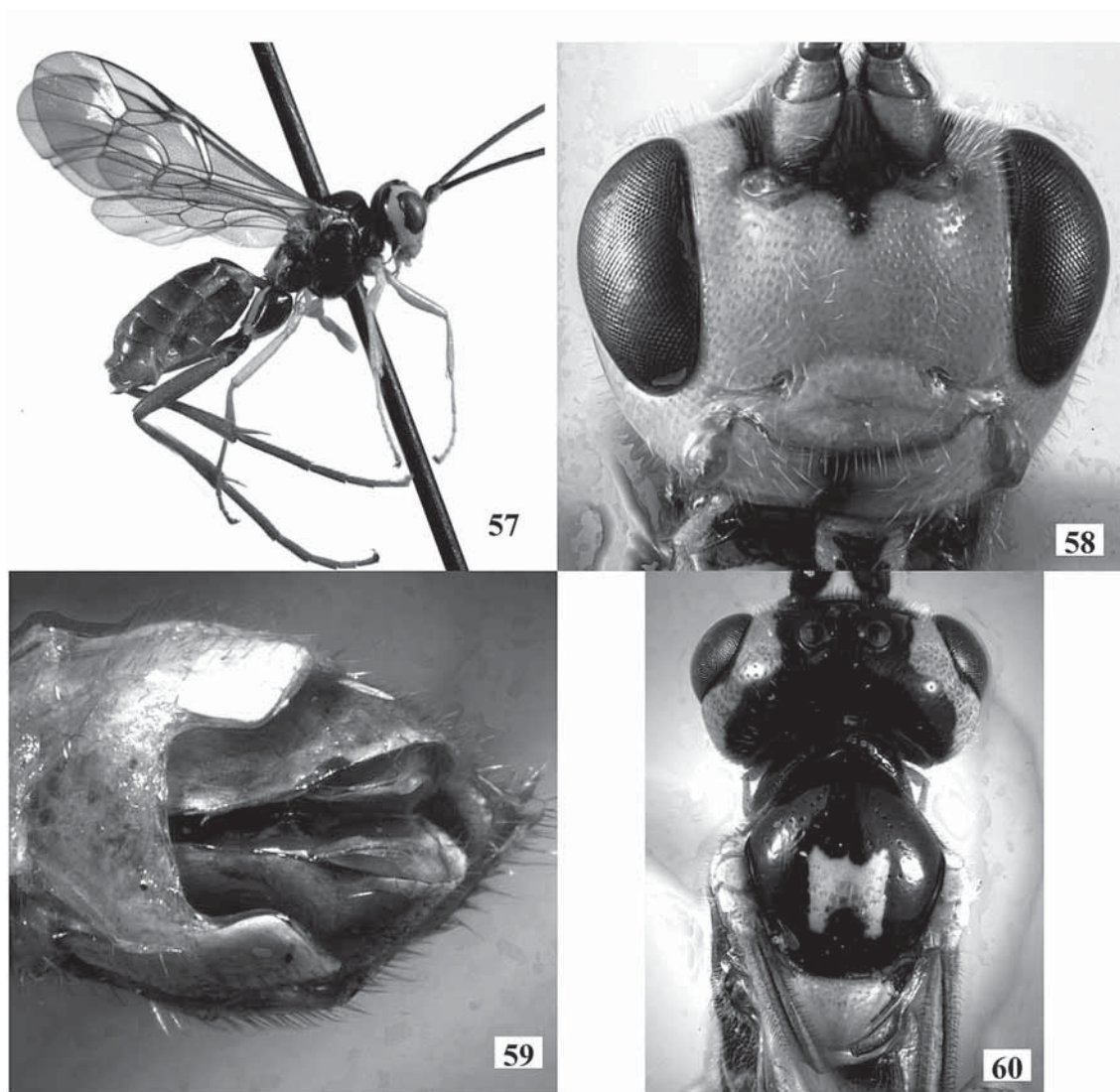
**Color:** Head mostly black in female, with most of clypeus, mandibles, and complete ocular ring yellow to pale yellow, male with face entirely or almost entirely yellow (Fig. 56), often with narrow black line dorsally extending from frons to dorsal tubercle of face. Antenna in female dorsally usually dark brown to black, ventrally dark brown basally to brownish orange apically, male antenna entirely black. Mesosoma almost entirely black, except meso- and metascutellum, a short pale stripe anterolaterally on mesoscutum, and a pair of irregular spots posterolaterally on propodeum pale yellow, male often with propodeum entirely black. Metasomal tergites mostly black with narrow, white apical margins. All coxae, trochanters, and trochantelli black. Fore femur white dorsally and sometimes anteriorly otherwise dark brown to black, mid femur more extensively dark brown to black, remainder of fore and mid legs mostly white, usually with some weak infumate marking especially on tarsomeres distally. Hind femur and tibia orange, tarsomeres and pretarsus black. Fore wing entirely hyaline.

**Material Examined.** Holotype: ♀ (AEIC, Type No. 3860), [USA, Arizona] first line of data label: “Portal, Arizona” second line: “Sept. 12, 1987” third line: “H. & M. Townes”. Paratypes: 18 ♀ 40 ♂, same data as

holotype except dates ranging 12–13.viii.1974 & 19.viii–23.ix.1987 (AEIC, TAMU); 3 ♀ Arizona, nr Roosevelt L, 29.iv.1947 (H&M Townes) (AEIC).

*Remarks.* Sexual dimorphism in facial color pattern was not observed in any other species of *Physotarsus*. This species is known only from southeastern Arizona. This is *Physotarsus* species 3 in the analyses conducted by Zhaurova and Wharton (2009).

The species name is an arbitrary combination of letters.



**FIGURES 57–60.** *Physotarsus truncatus* n. sp. 57, habitus; 58, face; 59, male genitalia, ventral view; 60, head and mesonotum, ♀, dorsal view.

***Physotarsus truncatus* Zhaurova, n. sp. (Figs 57–60)**

*Diagnosis.* Lateral ocelli separated by 1.2–1.5X their widest diameter from each other and about twice their widest diameter from eye margin. Antenna with 36–38 flagellomeres. Pronotum glabrous medially around and below lateral groove, punctate anterolaterally and dorsolaterally. Mesoscutum shiny, very sparsely punctate on anterior 0.4. T1 about 1.7–1.9X as long as broad. Head yellow with black stripe on vertex and frons; occiput black. Mesosoma largely black laterally, mesoscutum largely black with irregular yellow spot medially, mesosoma otherwise largely yellow dorsally (Fig. 60). T1 yellow basally with a black spot laterally



on each side covering posterior 0.5–0.7; remaining tergites mostly orange to light brown. Hind femur, tibia, tarsomeres and pretarsus uniformly orange. Fore wing entirely hyaline.

*Physotarsus truncatus* is one of several species with a black and yellow mesosoma, a distinctly punctate mesopleuron, and a sparsely to impunctate mesoscutum. It is nearly identical to *P. cordatus* and *P. emarginatus*, but the mesoscutum and mesopleuron are more extensively black in *P. truncatus*.

**Description. Female:** Body (Fig. 57) 4.8–6.0 mm, fore wing 4.5–4.8 mm. Head (Fig. 58): Clypeal margin widely subtruncate laterally, with thick, rounded central lobe. Clypeus about 2.4X as wide as long, divided medially by shallow transverse depression. Face densely covered with very short setae; setae longer, less dense on clypeus. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.5–0.6X width of mandibular base. Face twice as broad as long, slightly protruding in profile, face sparsely punctate laterally, more densely punctate medially. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.4–1.6X widest diameter of median ocellus. Lateral ocelli separated by 1.2–1.5X their widest diameter from each other and about twice their widest diameter from eye margin. Area between lateral ocelli slightly depressed; area immediately behind ocelli not sharply declivitous. Antenna with 36–38 flagellomeres; first flagellomere 5.8–7.5X longer than wide, 1.3X widest transverse diameter of eye, second flagellomere 0.4–0.5X length of first. Occipital carina present on ventral 0.6–0.7 of head. Mesosoma: Anterior margin of pronotum medially slightly emarginate, laterally rounded and upcurved. Lateral groove of pronotum well-developed, weakly sculptured, present at least on dorsal 0.6, usually complete to punctate-rugulose posterior margin. Pronotum glabrous medially around and below lateral groove, polished to very sparsely punctate immediately laterad lateral groove, punctate anterolaterally, and dorsolaterally. Mesoscutum shiny, very sparsely punctate on anterior 0.4 (Fig. 61). Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron quite densely punctate ventrally. Metapleuron evenly, densely setose. Propodeum without carinae; impunctate and glabrous medially, moderately punctate and pubescence laterally. Tarsal claws simple. Fore wing stigma narrow; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell about 3.1–3.2X longer than wide; 2rs-m 1.3–1.8X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.6X length of 2cu-a; cu-a interstitial relative to Rs&M. Hind wing M+Cu bowed to strongly bowed; basal abscissa of Rs 1.1X longer than rs-m; 1st abscissa of Cu1 0.8–1.3X longer than cu-a. Metasoma: T1 about 1.7–1.9X as long as broad; surface in profile flat basally, weakly convex posteriorly, dorsal tendon anchored on nearly flat surface; spiracles not protruding; dorsolateral carina extending about half distance to spiracle. Cerci distinct, slightly ovate, barely protruding.

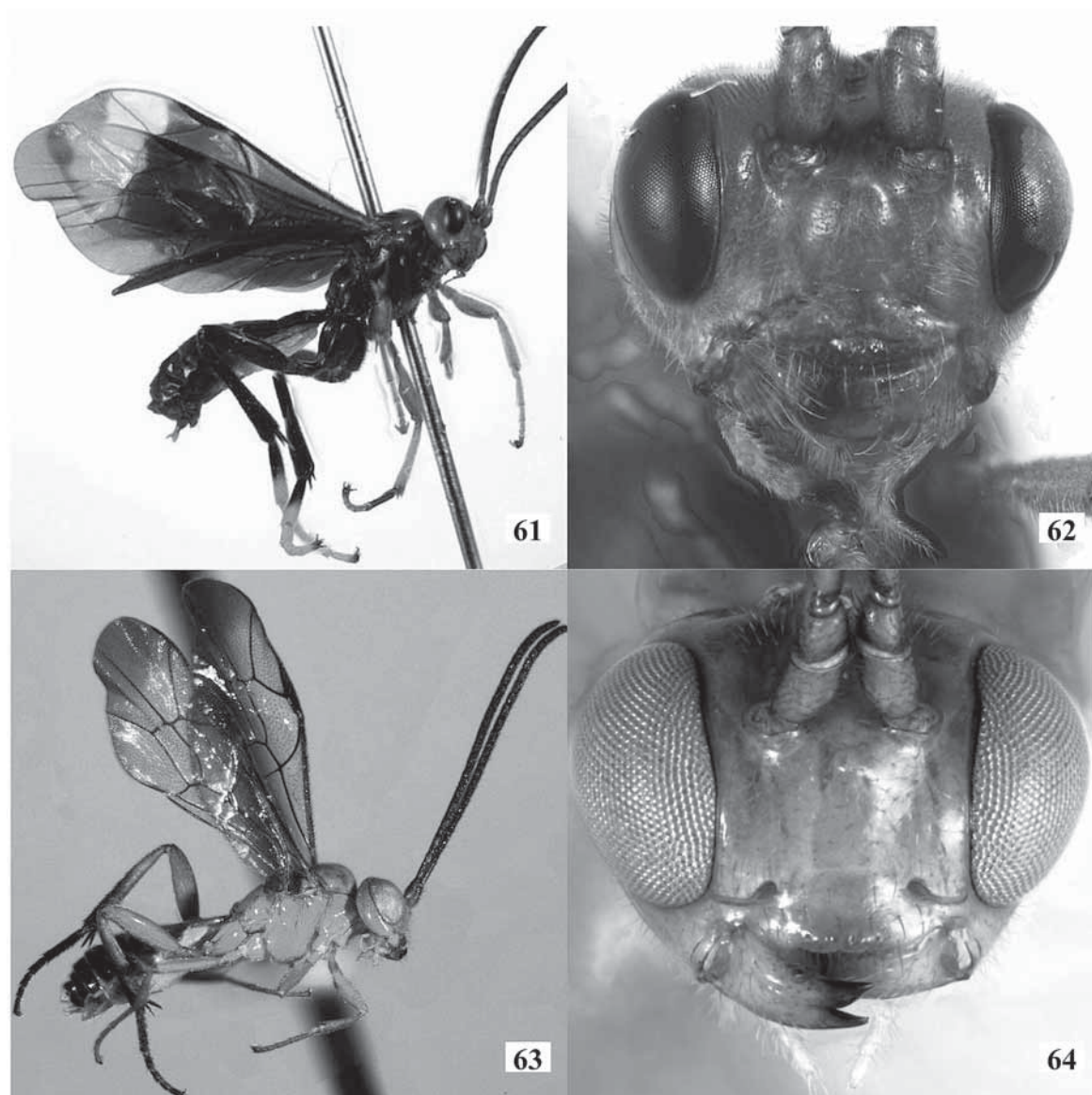
**Male:** Subgenital plate (Fig. 59) with wide, deep, truncate median incision, its margin even. Aedeagal margin not toothed. Fore wing 2rs-m 1.1X longer than abscissa of M between 2rs-m and 2m-cu; cu-a weakly antifurcal; otherwise similar to female.

**Color.** Head yellow with broad black stripe on vertex and frons usually extending as narrow line to dorsal tubercle on face; occiput black. Antenna brown at base, gradually becoming orange medially to bright pale orange subapically, dark brown apically, darker dorsally than ventrally, pale flagellomeres numerous, but number quite variable. Mesosoma largely black laterally, mesoscutum black with moderately large, irregular yellow spot medially (Fig. 60) and rarely with yellow spot or narrow line along anterolateral margin, mesosoma otherwise largely yellow dorsally; anterior margin of propodeum usually black, propodeum with triangular black marking anteriorly on either side of midline. T1 yellow basally with a black spot laterally on each side covering posterior 0.5–0.7; remaining tergites mostly orange to light brown especially laterally, T7–8 usually extensively yellow laterally. Fore and mid legs bright yellow, tarsomeres often darker yellow or yellow-orange. Hind coxa mostly black with broad yellow stripes dorsally and ventrally; trochanter and trochantellus dark brown to black, except trochantellus pale posteriorly; femur, tibia, tarsomeres, and pretarsus uniformly orange. Cerci dark. Fore wing entirely hyaline.

**Material Examined.** Holotype ♂ (AEIC, Type No. 3861): [USA, Texas] first line of data label: “Fredericksburg” second line: “V.7.1988 Tex.” third line: “H. & M. Townes”. Paratypes: 10 ♀, same data as holotype except dates ranging 30.iv–v.19.1988 (AEIC, TAMU).

*Remarks.* This species is nearly identical to *P. cordatus*, with differences in the male subgenital plate and minor differences in color. Since primary differences are associated with the male, the sole male of *P. truncatus* was chosen as holotype. Both species were collected from the same locality in central Texas.

The species name is Latin, referring to the truncate excavation in the male subgenital plate.



**FIGURES 61–64.** Habitus and face. 61–62, *Physotarsus varicornis*; 61, habitus; 62, face. 63–64, *P. jamesi* n. sp.; 63, habitus; 64, face.

***Physotarsus varicornis* (Cameron, 1886) (Figs 61, 62)**

*Scolobates varicornis* Cameron, 1886: 310. Lectotype ♂, here designated, in BMNH.

*Scolobates variicornis*: Dalla Torre, 1902: 328 (catalog, unjustified emendation).

*Physotarsus varicornis*: Townes in Townes & Townes 1966: 139 (new combination); Yu & Horstmann, 1997: 455 (catalog).

*Physotarsus davidi* Gauld, 1997: 197–198. Holotype ♀ in INBio, **new synonym**.

*Physotarsus davidi*: Yu & Horstmann, 1997: 455 (catalog).

*Diagnosis.* Lateral ocelli separated by 0.8X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Antenna with 35–38 flagellomeres. Pronotum and mesoscutum glabrous,

impunctate. T1 about 1.9–2.1X as long as broad. Head entirely reddish brown. Mesosoma black with upper part of pronotum, anterior part of mesoscutum and upper margin of mesopleuron reddish brown. Metasomal tergites black. Hind legs black, trochantellus reddish, distal 0.5 of basitarsus and remaining tarsomeres bright yellow. Fore wing fuscous with subapical pale yellowish band.

This species is most similar to *P. maculipennis*, with which it shares the smooth body, pectinate claws, and dark wing with pale subapical band. *Physotarsus varicornis* is a distinctly darker species.

**Description.** *Female:* Body (Fig. 61) 7.4–10.0 mm, fore wing 7.0–9.5 mm. Head (Fig. 62): Clypeal margin widely truncate laterally, with thick, somewhat angulate central lobe. Clypeus about 2.8X as wide as long, divided medially by transverse depression, with two small basolateral lobes weakly protruding in profile. Face densely covered with short setae. Anterior tentorial pits elongate and upcurved laterally. Malar space 0.5–0.6X width of mandibular base. Face 1.8X as broad as long, slightly protruding in profile, densely, finely punctate. Interantennal area flat, area immediately behind antennae weakly concave laterally, turning convex before reaching ocelli. Anterior margin of torulus situated at about 0.7 of eye height. Interantennal distance greater than distance between lateral ocelli. Widest diameter of torulus 1.4X widest diameter of median ocellus. Lateral ocelli separated by 0.8X their widest diameter from each other and about 1.8–2.0X their widest diameter from eye margin. Area between lateral ocelli flat, area behind ocelli not sharply declivitous. Antenna with 35–38 flagellomeres; first flagellomere about 4.0X longer than wide, 1.2X widest transverse diameter of eye, second flagellomere 0.6X length of first. Occipital carina present on ventral 0.2–0.3 of head. Mesosoma: Anterior margin of pronotum medially slightly bifurcate, laterally rounded, slightly upcurved. Lateral groove of pronotum vestigial, present on dorsal 0.2. Pronotum and mesoscutum glabrous, impunctate. Epicnemial carina parallels anterior margin of mesopleuron. Mesopleuron impunctate, sparsely pubescent ventrally. Propodeum with pleural carina almost entirely complete, interrupted medially; impunctate medially, quite densely pubescent laterally. Tarsal claws almost fully pectinate. Fore wing stigma narrow; Rs+2r arising from basal 0.3–0.4 of stigma; marginal cell 2.5–3.1X longer than wide; 2rs-m 2.2–2.3X longer than abscissa of M between 2rs-m and 2m-cu; Cu1a about 0.7–0.9X length of 2cu-a; cu-a antefurcal relative to Rs&M. Metasoma: T1 about 1.9–2.1X as long as broad; surface convex in profile; spiracles somewhat protruding in profile. Cerci not protruding.

*Male:* Similar to female in structure and color.

**Color.** Head entirely reddish brown. Antenna with scape and pedicel reddish brown, flagellum blackish brown, becoming black, but with ill defined subapical dirty whitish band. Mesosoma black with upper part of pronotum, anterior part of mesoscutum and upper margin of mesopleuron reddish brown. Metasoma black with sternites paler yellowish brown. Anterior two pairs of legs reddish brown with coxae blackish; hind legs black, trochantellus reddish, at least distal 0.5 of basitarsus and all remaining tarsomeres bright yellow. Fore wing fuscous with one subapical pale yellowish band; stigma black.

**Material Examined.** *Scolobates varicornis* Cameron, 1886: Lectotype ♂ GUATEMALA, San Gerónimo (Champion) (BMNH). *Physotarsus davidi*: Paratypes, 2 ♀ COSTA RICA, Guanacaste Prov., Santa Rosa National Park, 300 m, vi.1985 & vii.1986 (Gauld & Janzen) (BMNH).

**Remarks.** *Physotarsus varicornis* has only been collected in Guatemala and Costa Rica. Only three specimens were collected in Costa Rica despite intensive sampling there (Gauld 1997): the two specimens noted above and the holotype of *P. davidi* collected from Guanacaste National Park, Los Almendros, 100m, viii-ix.1992 (Lopez) (INBio). The specimen of *P. varicornis* labelled as “BM type Hym 3b.1109” is here designated as a lectotype because Cameron (1886) did not specify whether he based his description on one or more male individuals. However, he did indicate a range in body size (10–11 mm), which opens up the possibility that he had more than one specimen.

Comparisons of the lectotype of *varicornis* with the paratypes of *davidi* showed that the three specimens are nearly identical, sharing the same distinctive color pattern and all the diagnostic features noted by Gauld for *davidi*. Gauld (1997) did not compare his Costa Rican species with previously described species of *Physotarsus*, thus overlooking the potential for synonymy. *Physotarsus varicornis* is most similar to *P. maculipennis* from Mexico. They are both large-bodied species with reduced body sculpture and very dark



wings with distinctive pale bands or spots. Gauld (1997) suggested that the very striking color pattern of *P. varicornis* (as *P. davidi*) may mimic common ichnine cryptines such as some species of *Joppidium* Cresson.

### ***Physotarsus fabioi* Gauld, 1997**

*Physotarsus fabioi* Gauld, 1997: 199. Holotype ♀ in INBio.

*Physotarsus fabioi*: Yu & Horstmann 1997: 455 (catalog).

**Diagnosis.** Occipital and epicnemial carinae completely absent. Fore wing Cula distinctly longer than 2cu-a. Head, hind legs, and metasoma black. Mesosoma orange. Wings entirely fuscous.

**Remarks.** This species is known only from the female holotype. None of the first three character states listed in the diagnosis (complete absence of occipital and epicnemial carinae and short fore wing 2cu-a) is known in any other species of *Physotarsus*. More significantly, we were unable to detect any evidence of a tyloid on the first flagellomere. All members of the Scolobatini, to which *Physotarsus* belongs, possess a tyloid laterally on the first flagellomere (Gauld 1984, 1997; Zhaurova & Wharton 2009). The absence of a tyloid leads us to reject this species as a member of the genus *Physotarsus*, and from the Scolobatini. We can find no satisfactory place for *fabioi* and treat it as incertae sedis within the Ctenopelmatinae, with the suggestion that it represents an undescribed genus.

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### **References**

- Cameron, P. (1886) Insecta. Hymenoptera 1 (Families Tenthredinidae – Chrysididae). In: Godman, F.D. & Salvin, O. (Eds), *Biologia Centrali-Americana*. Taylor & Francis, London, pp. 241–328.
- Cameron, P. (1904) Description of a new genus and species of Hymenoptera from Mexico. *Transactions of the American Entomological Society*, 30, 251–267.
- Carlson, R.W. (1979) Family Ichneumonidae. In: Krombein, K.V., Hurd Jr., P.D., Smith, D.R. & Burks, B.D., *Catalog of Hymenoptera in America, North of Mexico*. Smithsonian Institution Press, Washington DC, pp. 315–740.
- Cresson, E.T. (1874) Descriptions of Mexican Ichneumonidae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1873, 374–413.
- Cresson, E.T. (1916) The Cresson types of Hymenoptera. *Memoirs of the American Entomological Society*, 1, 1–141.
- Dalla Torre, C.G. (1902) *Catalogus Hymenopterorum*. Volumen III. Trigonalidae, Megalyridae, Stephanidae, Ichneumonidae, Agriotypidae, Evanidae, Pelecinidae. Guilelmi Engelmann, Lipsiae, pp. 1–545 (1901) & pp. 545–1141 (1902).
- Gauld, I.D. (1984) *An introduction to the Ichneumonidae of Australia*. British Museum (Natural History), London, 413 pp.
- Gauld, I.D. (1997) Tribe Scolobatini. In: Gauld, I.D. *The Ichneumonidae of Costa Rica*, 2. *Memoirs of the American Entomological Institute*, 57, 187–199.

- Gauld, I.D. (2002) Introduction. In: Gauld, I.D., Sithole, R., Ugalde G., J. & Godoy, C. *The Ichneumonidae of Costa Rica, 4. Memoirs of the American Entomological Institute*, 66, 1–10.
- Gauld, I.D. & Wahl, D.B. (2002) The Eucerotinae: a Gondwanan origin for a cosmopolitan group of Ichneumonidae? *Journal of Natural History*, 36, 2229–2248.
- Gauld, I.D. & Wahl, D.B. (2006) The relationship and taxonomic position of the genera *Apolophus* and *Scolomus* (Hymenoptera: Ichneumonidae). *Zootaxa*, 1130, 35–41.
- Janzen, D.H., Hallwachs, W. (2006) Area de Conservacion Guanacaste (ACG), northwestern Costa Rica. Caterpillars, pupae, butterflies and moths. Available from <http://janzen.sas.upenn.edu/Wadulfs/resultslongrec2.lasso?-database=GCAvoucherDB&-table=www3&voucher=88-SRNP-67&-search> (accessed 4 March, 2009).
- Kasparyan, D.R. (2000) Palaearctic ichneumonid wasps of the genus *Mesoleius* (s. str.) Holmgren (Hymenoptera, Ichneumonidae): I. *Entomological Review*, 80, 144–168.
- Kasparyan, D.R. (2003) A new Palaearctic species of the genus *Syndipnus* Foerster (Hymenoptera: Ichneumonidae: Ctenopelmatinae). *Zoosystematica Rossica*, 12, 123–124.
- Kasparyan, D.R. (2004) A review of Palaearctic species of the tribe Ctenopelmatini (Hymenoptera, Ichneumonidae). The genera *Ctenopelma* Holmgren and *Homaspis* Foerster. *Entomological Review*, 84, 332–357.
- Kasparyan, D.R. (2006) Five new species of *Asthenara* Foerster from Mexico (Hymenoptera: Ichneumonidae: Ctenopelmatinae). *Zoosystematica Rossica*, 15, 327–330.
- Quicke, D.L.J., Fitton, M.G., Broad, G.R., Crocker, B., Laurenne, N.M. & Miah, M.I.. (2005) The parasitic wasp genera *Skiapus*, *Hellwigia*, *Nonnus*, *Chriodes*, and *Klutiana* (Hymenoptera, Ichneumonidae): Recognition of the Nesomesochorinae stat. rev. and Nonninae stat. nov. and transfer of *Skiapus* and *Hellwigia* to the Ophioninae. *Journal of Natural History*, 39, 2559–2578.
- Quicke, D.L.J., Laurenne, N.M., Fitton, M.G. & Broad, G.R. (2009) A thousand and one wasps: a 28S rDNA and morphological phylogeny of the Ichneumonidae (Insecta: Hymenoptera) with an investigation into alignment parameter space and elision. *Journal of Natural History*, 43, 1305–1421.
- Townes, H. (1946) The generic position of the Neotropic Ichneumonidae (Hymenoptera) with types in the Philadelphia and Quebec museums, described by Cresson, Hooker, Norton, Provancher, and Viereck. *Boletín de Entomología Venezolana*, 5, 29–63.
- Townes, H. (1966) *Physotarsus* In: Townes, H. & Townes, M., *A catalogue and reclassification of the Neotropic Ichneumonidae. Memoirs of the American Entomological Institute*, 8, 139, 330.
- Townes, H. (1969) Genera of Ichneumonidae, Part 1. *Memoirs of the American Entomological Institute*, 11, 1–300.
- Townes, H. (1970a) Genera of Ichneumonidae, Part 2. *Memoirs of the American Entomological Institute*, 12, 1–537.
- Townes, H. (1970b) Genera of Ichneumonidae, Part 3. *Memoirs of the American Entomological Institute*, 13, 1–307.
- Townes, H. (1971) Genera of Ichneumonidae, Part 4 *Memoirs of the American Entomological Institute*, 14, 1–372.
- Townes, H. & Townes, M. (1951) Family Ichneumonidae. In: Muesebeck, C.F.W., Krombein, K.V. & Townes, H.K. (Eds), *Hymenoptera of America North of Mexico Synoptic catalog. USDA Agriculture Monograph No. 2*. Government Printing Office, Washington DC, pp. 184–409.
- Townes, H. & Townes, M. (1966) A catalogue and reclassification of the Neotropic Ichneumonidae. *Memoirs of the American Entomological Institute*, 8, 1–367.
- Wharton, R.A., Roeder, K. & Yoder, M.J. (2008) A monograph of the genus *Westwoodia* (Hymenoptera: Ichneumonidae). *Zootaxa*, 1855, 1–40.
- Yu, D. & Horstmann, K. (1997) Catalogue of world Ichneumonidae (Hymenoptera). *Memoirs of the American Entomological Institute*, 58, 1–1558.
- Zhaurova, K. (2006) *A Revision of Physotarsus Townes, With a Preliminary Phylogenetic Analysis of Scolobatini (Hymenoptera: Ichneumonidae: Ctenopelmatinae)*. M.S. Thesis, Texas A&M University, College Station, Texas, 162 pp.
- Zhaurova, K. & Wharton, R. (2009) Recognition of Scolobatini and Westwoodiini (Hymenoptera, Ctenopelmatinae) and revision of the component genera. *Contributions of the American Entomological Institute*, 35(5), 1–77.